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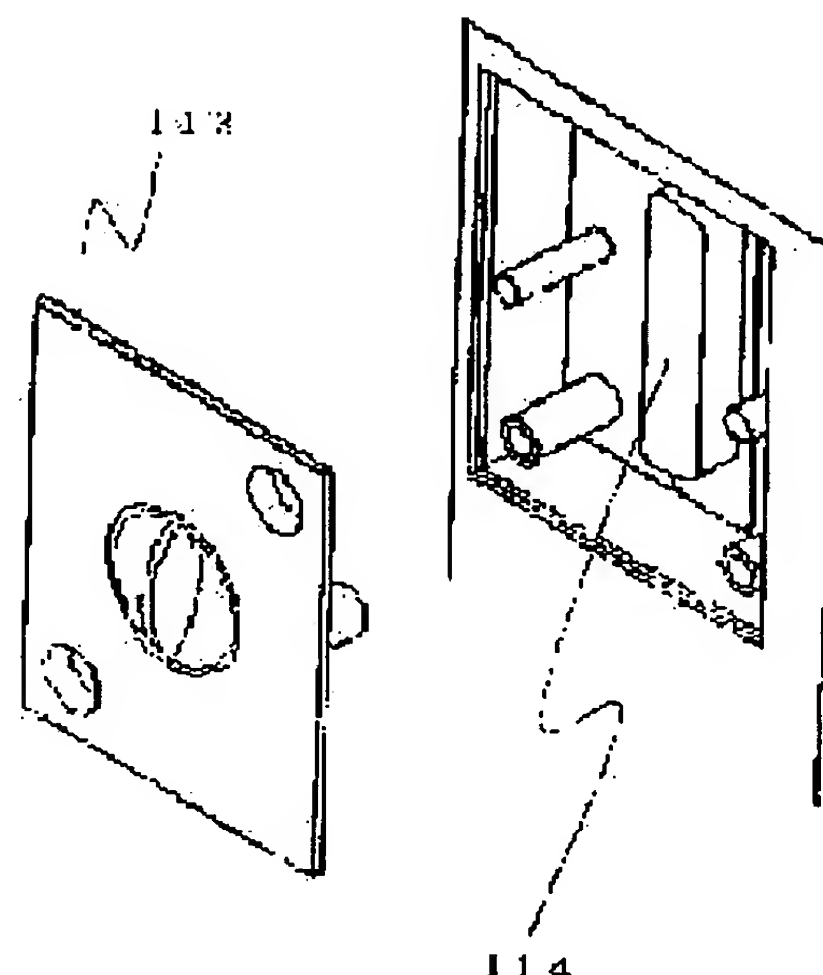
(72)Inventor : KUNITAKE YASUHIRO
HIRUTA YOSHIKI

(54) DETECTING APPARATUS AND UROANALYZER

(57)Abstract:

PROBLEM TO BE SOLVED: To transmit and receive data between an analyzer and an external apparatus and to inspect various components whose concentration is changed according to the condition of the health of a subject such as sugar, protein, occult blood, sodium ions, uric acid or the like.

SOLUTION: In this analyzer, the excretion of a user is collected, and the component of the excretion is analyzed. The analyzer is provided with an acquisition unit which is equipped at a toilet stool and which acquires the excretion. The analyzer is provided with an analytical unit which is not fixed to the toilet stool, which is connected to the acquisition unit via at least a carrying-in passage and which analyzes the component of the excretion. The analytical unit is provided with a communication terminal 114 which communicates with an external apparatus.



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CLAIMS

[Claim(s)]

[Claim 1] The analysis apparatus which extracts a user's excrement characterized by providing the following, and performs component analysis of this excrement. The acquisition unit which has the acquisition container with which a toilet bowl is equipped, and which acquires the aforementioned excrement. The analysis unit which has an analysis means for it not to be fixed to a toilet bowl, but to connect with the aforementioned acquisition unit through a carrying-in way at least, and to perform component analysis of the aforementioned excrement.

[Claim 2] It is the analysis apparatus according to claim 1 which the aforementioned analysis unit is equipped with a communications control means to communicate with the aforementioned external instrument through the aforementioned communication terminal, and is characterized by this communications control means performing at least any of processing of the following (1) - (4) they are.

(1) Data read-out from the non-volatile memory in the aforementioned analysis unit based on the data writing of the non-volatile memory in the aforementioned analysis unit based on the transmitting (3) external signal to the exterior of numeric data, such as time counted up with use of the transmitting (2) equipment to the exterior of the analysis result of the aforementioned analysis means, and the number of times, rewriting, and an elimination (4) external signal, transmission outside. [Claim 3] It is an analysis system using the analysis apparatus according to claim 2, and the aforementioned analysis unit is an analysis system connectable with any of the device of the following (A) - (F) they are at least.

(A) Processing of the above (1) is performed between the aforementioned analysis units, and the aforementioned analysis result between the transmitter (machine B) aforementioned analysis units which transmit to still more nearly another device Between the (Printer C) aforementioned analysis units which processing of the above (1) is performed and print the aforementioned analysis result Between the (personal computer D) aforementioned analysis units which processing of the above (1) is performed and carry out data control of the aforementioned analysis result Among the (Device E) aforementioned analysis units, such as a personal computer which the above (2) or processing of (4) is performed and performs failure analysis based on received data Devices, such as a personal computer which processes the above (3) and changes the control program of an analysis unit between the (test equipment F) aforementioned analysis units which process the above (3).

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the analysis apparatus which performs component analysis of excrement.

[0002]

[Description of the Prior Art] the foreign style toilet bowl installed in the toilet -- attachment and detachment -- being free (what defers a part to the floor being included) -- it is equipped, a sampling and analysis of urine are performed and health-care equipment (uroscopy equipment) equipped with the inspection means which can support an individual healthy check is proposed (For example, the uroscopy equipment which came to extract urine is indicated by making JP,62-187253, A rock the swing arm equipped with urine test within the ball of a toilet bowl.) While having formed the inspection washing field in the posterior part of a toilet bowl and analyzing a urine sample in this field, a urine test container is washed by the wash water injected from the washing nozzle.

[0003] In urine, various components for which the concentration is changed according to the health condition of subjects, such as sugar, protein, occult blood, sodium ion, and a uric acid, are contained. Therefore, it is necessary to inspect under proper measurement conditions (temperature, humidity, etc.) with the above uroscopy equipments using the constituent concentration sensor (it only considers as a "sensor" hereafter) which can measure correctly the concentration of the purpose component used as a subject of examination.

[0004]

[Problem(s) to be Solved by the Invention] Here, utilization had various technical problems about data transmission and reception with an analysis apparatus and an external instrument.

[0005]

[A The means for solving a technical problem, and its operation and effect] The acquisition unit which has the acquisition container with which extracts a user's excrement, and is the analysis apparatus which performs component analysis of this excrement, and a toilet bowl is equipped in this invention, and which acquires excrement in order to attain the above-mentioned purpose, It is not fixed to a toilet bowl but connects with an acquisition unit through a carrying-in way at least, and while having the analysis unit which has an analysis means to perform component analysis of excrement, an analysis unit is characterized by having a communication terminal for performing communication with an external instrument.

[0006] That is, since the analysis unit which has a communication terminal is not being fixed to the toilet bowl, the anxiety over the sanitary worries at the time of connecting an external instrument to a communication terminal and water is reduced.

[0007] The analysis unit is equipped with a communications control means to communicate with an external instrument through a communication terminal, as a suitable operation gestalt, and this communications control means performs at least any of processing of the following (1) - (4) they are.

(1) Data read-out from the non-volatile memory in an analysis unit based on the data writing of the non-volatile memory in an analysis unit based on transmission to the exterior of numeric data, such as time counted up with transmission to the exterior of the analysis result of an analysis means, and use of (2) equipment, and the number of times, and (3) external signals, rewriting, elimination, and (4) external signals, transmission outside.

[0008] Furthermore, it is desirable to make it an analysis system connectable with any of the device of the following (A) - (F) they are at least using this analysis apparatus.

(A) Processing of (1) is performed between analysis units and an analysis result between the transmitter machines and (B) analysis units which transmit to still more nearly another device Between the printers and (C) analysis units which processing of (1) is performed and print an analysis result Between the (personal computer D) analysis units which

processing of (1) is performed and carry out data control of the analysis result (2) Or between devices, such as a personal computer which processing of (4) is performed and performs failure analysis based on received data, and (E) analysis unit Devices, such as a personal computer which processes (3) and changes the control program of an analysis unit between the test equipment which processes (3), and (F) analysis unit.

[0009] Various concrete gestalten are explained below.

[0010] [1] as the object for line checking outgoing inspections -- the time of shipment -- an inspection result -- EEPROM -- writing -- check at once The content of EEPROM is cleared and shipped after conducting this inspection.

[0011] [2] A cable can tie a personal computer and an analysis unit as an object for failure analysis for a maintenance, and the following item can be called from EEPROM.

[0012] ** A model code, a series code, a water service system, the name of a country, a controller version, a manufacture maker, a plant, EEPROM capacity, the controller date of manufacture, a controller serial number, the controller total resistance welding time, the controller total usage count, the number of errors (number of times of generating of E01, E02, E03, E04, and E20).

[0013] ** Error information 1-4 (at the content of an error, the controller resistance welding time, an error generating year, the moon, a day, the time part).

[0014] ** A sensor usage count, the number of times of the remainder to a life, the sensor total usage count, sensor energization days, the remaining days to a life, a sensor turnover rate, the sensor total resistance welding time.

[0015] ** At ON time by the power-saving time 1-4, OFF time, a setting year, the moon, a day, the time

[0016] ** Record of the sensor calibration value from the newest to the past 7 times (at the time of Gain, base, ADH and ADL, and sensor energization). For the microcomputer input AD value of base voltage, and ADH, the object for the high concentration of microcomputer input voltage and ADL are [Gain / the amplification amplification scale factor from a sensor, and base] an object for the low concentration of microcomputer input voltage.

[0017] [3] Attach the communication adapter for communication with the exterior in an analysis unit, fly a signal by infrared light to the receiving set in a toilet (cordless handset of home use FAX), and transmit to a home FAX main part through radio from a cordless handset. This data (** and --, such as measurement date time, measurement data, manufacture serial No of a main part, and Device No) is transmitted. Data are once saved on a home FAX main part, and the transmitted data are transmitted when the communication line is open. Moreover, since the data itself are saved in the interior of home FAX, it becomes possible [carrying out data output if needed]. Furthermore, the data of a moon unit are graph-ized and print-out is possible.

[0018] Moreover, the comment about data is periodically sent to home use FAX from the doctor.

[0019] [4] It is possible to attach a printer in an analysis unit using the terminal for printers. It is possible to output data for every measurement.

[0020] [5] A user is able to call the memorized data using the personal computer for a stored data output, and to manage his own data personally. Moreover, in life change of the content change sensor of EEPROM in [6] installation sites which become possible [graph-izing data] using this personal computer (the life lived long) (for example, a sensor life), though four months and 720 times turn into 1080 times for six months, the content of EEPROM is rewritten from the exterior with a personal computer, and change of goods specification of it is attained in an instant.

[0021] [7] Tie to the personal computer which is outside a toilet with a cable from the external communication terminal tied to a personal computer on-line, carry out measurement data a personal computer side serially, and transmit. With a personal computer, data are processed and this data is managed.

[0022] Although applying to urinalysis equipment is desirable as for the analysis apparatus explained above, it is good for sweat besides the excrement by stool actions, such as urine and facilities, saliva, an ovulation object, menstrual blood, etc. In addition, as target matter in urine, urine sugar, protein, occult blood, sodium ion, a uric acid, etc. can be treated.

[0023] The measurement data illustrated here has the following meaning, respectively. Urine sugar is utilizable for diabetic prevention, discovery, treatment, etc. Protein is also called albumin in urine and can be utilized effective in the early detection of diabetic nephropathy. Since it is said that it does not recover unless especially diabetic nephropathy treats by discovering at an early stage very much, detection of the albumin in urine has high effectiveness. It is known for the early stage of diabetic nephropathy that albumin will be excreted by the minute amount in urine. Therefore, if detection of it is enabled using the albumin of such a minute amount as measurement data, it is utilizable for the early detection of diabetic nephropathy. Naturally, it is effective also in discovery of the nephropathy of non-diabetes nature.

[0024] Occult blood is one of the signs of the inflammation produced in a kidney, a ureter, an urethra, etc., a calculus, etc. In an early stage, that blood is mixing into urine cannot check at a glance, but it is in the state where it is called the asymptomatic hematuria which does not have a subjective symptom to him, either. In the health-care equipment of this

invention, if occult blood is made into measurement data, since it is possible to detect occult blood in the stage of this - asymptomatic hematuria, it is utilizable for sick early detection and sick treatment various [above-mentioned].

[0025] Sodium is the measurement data used as the standard of the intake of the salinity of a day. As for a factor and bird clappers, such as hypertension and heart failure, salinity is known well. For such prophylaxis and treatment, it is desirable to control the intake of salinity to a suitable value. However, the intake of salinity does not necessarily meet the taste and a lot of salinity may be contained also in the food which is not felt so saltily in many cases. On the other hand, it is known that it is proportional to the intake for sodium salt in urine mostly. Therefore, the thing which detects sodium as measurement data, then the intake of salinity can be grasped, and it can utilize for the control.

[0026] The uric acid is known as causative agents, such as gout. As for the uric acid, about 80 a little less than% of the composite quantity of a day is said to be excreted in urine. Therefore, if the uric acid in urine is measured, a uric-acid value in the living body can be presumed, and it can utilize for the prophylaxis of gout and others, and treatment.

[0027] It does not pass to instantiation, in addition the various measurement data explained here can make various measurement data into the measuring object of this invention. Naturally, it does not matter as an object of measurement of two or more measurement data.

[0028]

[Embodiments of the Invention] In order to clarify its composition and operation further about this invention explained above, the suitable operation gestalt of this invention is explained below. In addition, although the following explanation explains uroscopy equipment equipped with an urine sugar sensor, it cannot be overemphasized that this invention can be applied also to uroscopy equipment equipped with the constituent concentration sensor for detecting the physical quantity (concentration, mass, volume, number, etc.) of other components (protein, occult blood, a creatinine, sodium ion, etc.).

[0029] Drawing 1 is the foreign style toilet bowl 100 (the seat 102, the facilities cover 104, and a wash water tank 106 are included.) equipped with the uroscopy equipment 10 (the measurement unit 11 and the rim attachment formula urine test unit 12 are included) which is 1 suitable operation gestalt of this invention, and this uroscopy equipment 10. In addition, both the seat 102 and the facilities cover 104 are the external views of an open state. It is the block diagram in which drawing 2 shows the foreign style toilet bowl 100 of drawing 1, and the side elevation of the rim attachment formula urine test unit 12 (both the seat 102 and the facilities cover 104 are a closed state), and drawing 3 shows the outline of the composition of uroscopy equipment 10.

[0030] The piping 14 for which the Gokami section is equipped with the wash water tank 106, and the foreign style toilet bowl 100 supplies a wash water to this wash water tank 106 to the measurement unit 11 is connected. The measurement unit 11 is deferred to the floor, as shown in drawing 1 (it mentions later for details). As shown in drawing 1 and drawing 2, the rim of the foreign style toilet bowl 100 is equipped with the rim attachment formula urine test unit 12.

[0031] Moreover, the measurement unit 11 and the rim attachment formula urine test unit 12 The water supply section 15 connected to a wash water tank 106 as shown in drawing 3 (although not illustrated, the strainer from which the dust contained in the water which supplied water is removed is built in), The rotary-valve syringe 18 which consists of a pump 16, and the rotary valve and syringe for supplying water in water from a wash water tank 106, The liquid receptacle container 25 which receives the leakage of water and overflow water from this rotary-valve syringe 18, The rotary-valve drive motor 20 (when calling a rotary valve and the rotary-valve drive motor 20 collectively) which drives a rotary valve The syringe drive motor 22 which drives a syringe as calling it the electric rotary valve 176, The urine test arm drive motor 23 which drives the urine test arm 32 which extracts the urine excreted from the user, and in which ***/receipt is free, The proofreading liquid tank 24 which stores proofreading liquid, and the buffer-solution tank 26 which stores the buffer solution, The urine sugar sensor 28 which changes urine sugar into an electrical signal, and the nozzle 30 which washes the urine test arm 32, The electrode 34 which detects whether urine was extracted in the urine test arm 32, and a controller 36, The display 39 for reporting to the control unit 38 and user who are operated by the user, The sound source 29 for similarly reporting to a user, and the human body detection sensor 260 which detects the existence of a human body, The heating unit 250 which heats the urine sent by the urine sugar sensor 28, proofreading liquid, etc. to an optimal temperature, The temperature sensor 251 which detects solution temperature directly or indirectly, and the temperature sensor 261 which acts as the monitor of the temperature of the toilet interior of a room, the heating unit 236 which heats the measurement unit 11 inside of a plane or -- indirect -- for proofreading liquid or the buffer solution, and the temperature sensor 237 which detects this temperature are made into the main component parts A dotted line, an arrow (thin line), and an arrow (thick line) show an electric path, the flow of water, and the flow of urine, proofreading liquid, and the buffer solution among drawing, respectively.

[0032] Although illustration is not carried out, when measuring another components other than urine sugar, neither the sensor section which carries out sensing of the component, nor each liquid tank, piping, etc. can be overemphasized as

the additional need and a bird clapper.

[0033] Drawing 4 is the block diagram of the rim attachment formula urine test unit 12. The rim attachment formula urine test unit 12 is made of the resin which used an antibacterial material (for example, a tapir a tequila (registered trademark) and ZEOMIKKU (registered trademark)) the sake [on a health disposition]. The urine test arm 32, the washing nozzle 30, the urine test arm drive motor 23, a tube 152, a distributing water pipe 186, the feed pipe 151 to the washing nozzle 30, etc. are installed in the base 650 made of a resin, and the rim attachment formula urine test unit 12 is constituted. In addition, a distributing water pipe 186 and a tube 152 throw away, the toilet bowl is faced the water inlet and it can discharge drainage now in a toilet bowl.

[0034] As shown in drawing 4, rubber, the sucker 651, etc. are attached in the part which contacts the rim of the foreign style toilet bowl 100 among the rim attachment formula urine test units 12.

[0035] Rubber, a sucker 651, etc. are the purposes which prevent shakiness, in case a user sits down and uses it for the seat 102, they attach the big parts or big member of coefficient of friction so that the rear face of the rim attachment formula urine test unit 12 and the rim of the foreign style toilet bowl 100 may not be slippery, and they have heightened the skid effect.

[0036] The skid effect in which a user's weight was applied to rubber, the sucker 651, etc., and described above the place in which rubber, a sucker 651, etc. are attached by making it the lower part which the cushion (seat leg) of the seat 102 contacts can be heightened further.

[0037] Since the cushion (seat leg) of the seat 102 contacts, from other parts, much more, the rim attachment formula urine test unit 12 is designed low (refer to drawing 2), and is maintaining the levelness of the seat.

[0038] Drawing 5 shows structural drawing of the urine test arm 32. The urine test arm 32 serves as the quality of the material which performed plating processing to the metal in consideration of cleaning nature and intensity. The configuration of the point (urine test section 652) of the urine test arm 32 has a bowl form, and it is not only the configuration which is easy to store urine, but is attached so that a urine test mouth may turn to the abbreviation upper part in a urine test position.

[0039] Drawing 6 shows the **** position of the urine test arm at the time of urine test. In the male and the woman, the positions suitable for urine test differ and **** in the direction of a female position is large (specifically, adult males are 44 abbreviation from the level surface, and adult women are 75 abbreviation).

[0040] Moreover, a standard **** position is carried out focusing on abbreviation, and it is considered that it can fine-adjust in an order position (refer to drawing 7). The electrode 34 of urine detection is arranged inside this bowl, and it is easy to judge whether urine was extractable. Moreover, since it is installed in the position which can secure the volume which needs an electrode 34 for measurement when the urine test arm 32 comes out to the interior of a toilet bowl at the time of urine test, when an electrode 34 carries out urine detection, the urine of a complement collects on measurement at bowl circles. It seems that therefore, it moves to measurement while sufficient quantity of urine cannot have been found, and mistaken measurement is not performed.

[0041] For prevention of spilling of foreign matter mixing from the urine test arm 32 and urine, the mesh-like filter 656 is installed in the urine test section 652 of the urine test arm 32 (refer to drawing 5).

[0042] Although the mesh filter 656 is consisting of urine test arms 32 (or urine test section 652) free [attachment and detachment] and the cleaning nature of the urine test section is raised, you may fix to the urine test arm 32 in one on the contrary for loss prevention of the mesh filter 656. Here, in order to raise health nature, the mesh filter 656 has performed the antibacterial treatment. Of course, as a prevention member of foreign matter mixture or urine spilling, not only a mesh-like filter but the film of the shape for example, of sponge can be substituted.

[0043] In this example, it connects with the wash water tank 106, and the water supply section 15 is supplying water to the rotary-valve syringe 18 or the nozzle 30 in the tap water in a wash water tank 106 using the suction force of a pump 16.

[0044] You may omit a pump 16, as long as it makes it branch before and behind a part of stream fed with a pump inside this toilet bowl warm water flush system, or the reduced pressure bulb of direct water supply and makes it lead to the water supply section 15 when water is supplied by linking the water supply section 15 with water service directly, and using the feed water pressure of this water service or the toilet bowl warm water flush system is installed independently, although not illustrated. If it does in this way, the water supply system in the measurement unit 11 can be simplified more.

[0045] Moreover, although it does not illustrate when the toilet bowl warm water flush system is installed, you may branch the water supply section 15 by the part which branches this interconnecting tube for toilet bowl warm water flush system water supply from the feed pipe of a wash water tank 106.

[0046] Furthermore, although it does not illustrate when the toilet bowl warm water flush system is installed, when this interconnecting tube for toilet bowl warm water flush system water supply that branched from the feed pipe of a wash

water tank 106 connects the water supply section 15 with the part connected with this toilet bowl warm water flush system, this tee is concealed by this toilet bowl warm water flush system, and an exterior is also satisfactory, and connection construction can also be simplified.

[0047] Next, the measurement unit 11 is explained in detail using drawing 8 (front view), drawing 9 (only a right lateral view, however lower part), drawing 10 (left lateral view), and drawing 11 (plan). Although the measurement unit 11 is longwise constituted as drawing 8 - drawing 10 show, it can be operated easily, without the user who deferment not only becomes possible also in a narrow toilet, but sat down the control unit (it mentions later about this) prepared in the unit upper surface to the toilet bowl breaking down a taking-a-seat posture, if it does in this way. The three screw wearing sections 112 which have a screw hole are formed in the tooth back of the measurement unit 11 at the center, and if the tooth back of the measurement unit 11 is screwed on a wall 119 through a screw here, a possibility that the measurement unit 11 may fall will disappear. Moreover, the tooth back of the measurement unit 11 is equipped with the hook receptacle 115, and if this hook receptacle 115 is made to engage with the hook 117 separately fixed to the wall 119, at the time of maintenance check, it can remove the measurement unit 11 from a wall surface easily, and it not only can prevent the fall of the measurement unit 11, but can move.

[0048] Drawing 12 is the perspective diagram showing the proofreading liquid supplement mouth 242 and the buffer-solution supplement mouth 262.

[0049] First, the relation of nose-of-cam 244a of the nozzle 244 for a proofreading liquid supplement inserted in the proofreading liquid supplement mouth 242 and this proofreading liquid supplement mouth 242 is explained using drawing 13 (a) - (c).

[0050] As shown in drawing 13 (a), the proofreading liquid supplement mouth 242 has three crevices formed in the circular entrance at intervals of 120 degrees.

[0051] On the other hand, as shown in drawing 13 (b) and (c), nose-of-cam 244a of the nozzle 244 for a proofreading liquid supplement has two heights by which the circular twist of the entrance of the proofreading liquid supplement mouth 242 was also formed a little in the small circular outlet of a path at intervals of 120 degrees.

[0052] On the occasion of a supplement of proofreading liquid, the nozzle attachment mouth of the proofreading liquid bottle (not shown) into which the proofreading liquid for a supplement went first is equipped with bond-part 244b of the nozzle 244 for a proofreading liquid supplement, and nose-of-cam 244a is inserted in the proofreading liquid supplement mouth 242. At this time, only when the above-mentioned crevice and heights are in agreement, the insertion of nose-of-cam 244a of the nozzle 244 for a proofreading liquid supplement to the proofreading liquid supplement mouth 242 is attained.

[0053] Moreover, the relation of nose-of-cam 264a of the nozzle 264 for a buffer-solution supplement inserted in the buffer-solution supplement mouth 262 and this buffer-solution supplement mouth 262 is explained using drawing 14 (a) - (c).

[0054] As shown in drawing 14 (a), the buffer-solution supplement mouth 262 has four crevices formed in the circular entrance at intervals of 90 degrees.

[0055] On the other hand, as shown in drawing 14 (b) and (c), nose-of-cam 264a of the nozzle 264 for a buffer-solution supplement has two heights by which the circular twist of the entrance of the buffer-solution supplement mouth 262 was also formed a little in the small circular outlet of a path at intervals of 180 degrees. On the occasion of a supplement of the buffer solution, the nozzle attachment mouth of the buffer-solution bottle (not shown) into which the buffer solution for a supplement went first is equipped with bond-part 264b of the nozzle 264 for a buffer-solution supplement, and nose-of-cam 264a is inserted in the buffer-solution supplement mouth 262. At this time, only when the above-mentioned crevice and heights are in agreement, the insertion of nose-of-cam 264a of the nozzle 264 for a buffer-solution supplement to the buffer-solution supplement mouth 262 is attained.

[0056] Furthermore, since nose-of-cam 264a of the nozzle 264 for a buffer-solution supplement is physically unable to insert nose-of-cam 244a of the nozzle 244 for a proofreading liquid supplement in the buffer-solution supplement mouth 262, and to be inserted in the proofreading liquid supplement mouth 242, a liquid supplement mistake is avoidable.

[0057] Moreover, the structure which combines the nozzle 244 for a proofreading liquid supplement with a proofreading liquid bottle, Change the structure which combines the nozzle 264 for a buffer-solution supplement with a buffer-solution bottle. (For example, the structure of bond-part 244b of the nozzle 244 for a proofreading liquid supplement, the configuration of bond-part 264b of the nozzle 264 for a buffer-solution supplement, a bore, etc. are changed) If it is made like, the attachment mistake of the nozzle of attaching the nozzle for a proofreading liquid supplement in a buffer-solution bottle accidentally is avoidable.

[0058] For example, as shown in drawing 8 and drawing 10, while enabling it to contain the nozzle 244 for a proofreading liquid supplement, and the nozzle 264 for a buffer-solution supplement above the proofreading liquid

supplement mouth 242 of the measurement unit 11, and the buffer-solution supplement mouth 262 and discarding only a proofreading liquid bottle or a buffer-solution bottle, you may enable it to reuse the nozzle 244 for a proofreading liquid supplement, and the nozzle 264 for a buffer-solution supplement.

[0059] You may establish the place which makes the nozzle 244 for a proofreading liquid supplement, and the nozzle 264 for a buffer-solution supplement contain in the background of the covering 116 shown in drawing 10 as shown in drawing 15 .

[0060] Drawing 16 is a view view while one example of the measurement unit 11 is shown. (However, inner opportunity tubes and harnesses are not shown) A control unit 38, a display 39, and the human body detection sensor 260 are arranged at the measurement unit 11 upper-surface section. Moreover, the urine sugar sensor 28 is installed in the up side of the measurement unit 11, and is covered with covering 243. The rotary-valve syringe 18 is installed in the bottom of the urine sugar sensor 28, and the heating unit 250 and temperature sensor 251 for making regularity solution temperature sent to the urine sugar sensor 28 are prepared in the piping path between this rotary-valve syringe 18 and the urine sugar sensor 28. Moreover, the tanks 24 and 26 made of the resin for storing proofreading liquid and the buffer solution required for measurement are arranged at the bottom of the measurement unit 11, and the heating unit 236 and temperature sensor 237 for preventing the freeze of tanks 24 and 26 and the liquid in piping are installed near the tanks 24 and 26. In addition, the temperature sensor 261 which acts as the monitor of the temperature of the toilet interior of a room, a pump 281, a power transformer 282, a power supply section 215, the fall detection switch 283, etc. are arranged in a proper place. Moreover, the terminal 114 (for example, RS232C) for communication is also formed.

[0061] The tanks 24 and 26 which store the buffer solution and proofreading liquid are arranged at the lower part of the measurement unit 11. Since adhering to electronic parts or a device is lost even if liquid should leak from a tank by being arranged a power supply section 215 and below various electric drive meanses, it is safe, without resulting [from damage or degradation of these electronic parts and a device with liquid-ed] in a fire or a short circuit. Moreover, the drain 210 is established in the lower part of a tank at each, and the base of tanks 24 and 26 inclines toward drain 210 direction. A drain 210 can do liquid omission of proofreading liquid or the buffer solution simply only by operating a drain 210 from the outside, without decomposing the measurement unit 11, since it is open for free passage to the exterior of the measurement unit 11.

[0062] The stability of measurement unit 11 the very thing increases by arranging the tanks 24 and 26 which proofreading liquid and the buffer solution are furthermore filled and have a weight at the lower part.

[0063] Moreover, the measurement unit 11 also takes into consideration the thing in a place (for example, toilet room of rental housing) it is not desirable to drill a screw hole etc. in a wall 119 to do for **** installation, and is designed. For example, in order to carry out deferment to stability, the main part of the measurement unit 11 is constituted from the upper part by the breadth at last in the lower part, so that drawing 10 may show. Moreover, in order to carry out deferment to stability more, it has the elastic reinforcement foot 111. In addition, this reinforcement foot 111 is equipped with screwed adjuster 111a which can adjust height. (of course, you may prepare adjuster 111a in the leg prepared in the measurement unit 11 even if it was not the reinforcement foot 111 directly.) If it fills up with a liquid further so that drawing 16 may show, sense of stability is raised more by having arranged the proofreading liquid tank 24 and the buffer-solution tank 26 by which a weight becomes large in the main part lower part.

[0064] Next, the component part mentioned above is explained in detail.

[0065] Although the human body detection sensor 260 which detects invasion (or recession) of the existence of the man of the toilet interior of a room or the man to the toilet interior of a room is formed in the urinalysis equipment of this invention and a controller 36 controls various actuators to it based on the output of the human body detection sensor 260, it mentions later for details. In drawing 16 of this example, the human body detection sensor 260 is installed in the control unit 38 of the measurement unit 11, and about 39 display, and although what detects the infrared reflected light as a detection means is illustrated, if it is a suitable installation to detect a human body and a detection means, it will not be limited to this.

[0066] For example, places other than measurement unit 11, such as the front section of the rim attachment formula urine test unit 12, are sufficient as an installation. A detection means may be an electrostatic-capacity formula which is the microswitch and pressurization electrical conductive gum which detect taking a seat to the seat of a human body, or detects change of electrostatic capacity. Or you may detect a human body indirectly by detecting operation of each switch of a control unit 38. Furthermore, you may divert the human body detection means with which toilet bowl warm water flush system equipment was equipped (common-use-izing).

[0067] The rotary-valve syringe 18 has a cylinder 166 and a piston 168, as shown in drawing 17 , and this piston 168 moves up and down by changing rotation of the syringe drive motor 22 into rectilinear motion according to the leading-screw mechanism 172. A controller 36 controls the distance of the rotary-valve syringe 18 by driving the

syringe drive motor 22. The port 174 of the rotary-valve syringe 18 is connected to the electric rotary valve 176. The electric rotary valve 176 consists of a stator 178 equipped with two or more ports, Rota 180, and a rotary-valve drive motor 20 controlled by the controller 36. A controller 36 is ** which attracts or breathes out liquids (water, the buffer solution, proofreading liquid, urine, etc.) by driving the rotary-valve drive motor 20 and rotating Rota 180 by connecting the port 174 of the rotary-valve syringe 18 to which port of a stator 178, and driving the rotary-valve syringe 18. A stator 178 has six ports and is open for free passage to the exhaust pipe 186 extended in the ball section of a wash water tank 106, the buffer-solution tank 26, the proofreading liquid tank 24, the conveyance tube 150 (the outlet 120 of the urine sugar sensor 28 is extended in the ball section with the tube 152) to the entrance 118 of the urine sugar sensor 28, the conveyance tube 76 from the urine test arm 32, and the foreign style toilet bowl 100, respectively. [0068] In addition, the port 174 is attached up to the cylinder 166 and the piston 168, and it is constituted so that the air bubbles attracted in the syringe can remove from the inside of a syringe easily by buoyancy. Moreover, as more preferably shown in drawing 16 and drawing 17, the way arranged in a cylinder 166 and the piston 168 abbreviation perpendicular direction can discharge the air in a cylinder 166. Air does not remain in a syringe by this composition, therefore air bubbles are conveyed in the urine sugar sensor 28, and it does not have bad influence on measured value. [0069] The above-mentioned rotary bulb syringe 18 separates the electric rotary valve 176 from the upper part of a cylinder 166, and it is constituted so that Rota 180 can be exchanged for another Rota so that drawing 17 may show. If Rota which follows, for example, has many ports more is used instead of above-mentioned Rota 180, it is also possible to add a sensor, a proofreading liquid tank, etc. for inspecting another components other than urine sugar to a measurement unit.

[0070] When the buffer solution is filled up with the piping restoration in Step S200 of drawing 24 mentioned later, conveyance tube 150, a tube 152 (the conveyance tube 150 and a tube 152 are hereafter called sensor pipe collectively), and an exhaust pipe 186 are fixed to the same height from a floor in each nose of cam (open end) so that the same pressure (atmospheric pressure) may join each port in a stator 178. For this reason, even if it is the case where each port in the stator 178 of the conveyance tube 150 and an exhaust pipe 186 is open for free passage, only the amount which was able to define the proofreading liquid which the liquid with which it filled up is not mixed, and is driven into the conveyance tube 150 after that, and the sample (urine) can be made to reach the urine sugar sensor 28 certainly.

[0071] Drawing 18 is the schematic diagram of the internal structure of the proofreading liquid tank 24 and the buffer-solution tank 26. The electrodes 621, 622, 623, and 624 as a volume detection means were inserted in the proofreading liquid tank 24 and buffer-solution tank 26 interior in the perpendicular direction, and volume is changed into the electrical signal.

[0072] On the other hand, as the same volume detection means, the display material 626 which is indicating by volume is supported by float 625 and the front face by the float bearing bar 627, and it rotates to the circumference of a shaft 629. By the window part 628, the display of display material can be displayed now on the exterior of the measurement unit 11. What it is easy to check volume in parallel, filling up liquid since this window part 628 is installed in 242 or about 262 supplement mouth of liquid, therefore it carries out carelessly more than full of water at the time of a supplement of liquid, and floods liquid is prevented.

[0073] moreover -- an electrode -- the longest -- an electrode -- being common -- ** -- carrying out -- being long -- order -- an electrode -- (-- L --) -- 622 -- an electrode -- (-- M --) -- 623 -- an electrode -- (-- H --) -- 624 -- it is . The inside of the parenthesis of an electrode expresses oil-level height, respectively, and three level, L level which detects that sufficient volume required for measurement was lost, M level which announces that volume has decreased beforehand and is reported to a user, and H level which detects that the liquid supplement became enough, is set up. According to the grade of the volume measurement which it is not limited to this but is needed, how many [two or more] are sufficient as the number of electrodes.

[0074] M level mentioned above has a good liquid residue at about 5 - 15% of the sensitive volume in a tank.

[0075] In addition, if set to L level and M level, although the proofreading liquid supplement Light Emitting Diode 393 of drawing 23 mentioned later and the buffer-solution supplement Light Emitting Diode 392 would be made to blink and turn on and the volume detection means mentioned above will have reported to the user at this example, it is possible to connect meanses (for example, optical communication etc.) to communicate to the toilet exterior with the terminal 114 for communication of drawing 16 . By doing so, it becomes possible to receive the fall of volume with communicative receiving meanses (for example, portable remote control etc.), even if a user does not go on that occasion. Having mentioned above cannot be overemphasized by that a sensor life detection means to mention later can be communicated similarly.

[0076] Although two kinds of volume detection meanses of an electrode and float are established in drawing 18 of an example, using rotation of the shaft 629 which rotates with the float 625 which carries out movable according to

change of volume, position detection meanses, such as a Hall IC and a microswitch, may be established, this may be changed into an electrical signal, and an electrode becomes unnecessary in this case. If similarly 4s ** are displayed on the electrical signal detected by the electrode and volume is displayed on 242 or about 262 tank liquid supplement mouth, float 625 is not used but its ** is also good.

[0077] Although tank volume is detected by the electric conduction between the common electrode 621 and each volume detection electrodes 622, 623, and 624 as described above, if it always energizes to inter-electrode, the component of liquid will deposit in an electrode. Then, the energization to an electrode is restricted only to a short time when the controller 36 which is a control section needs to check tank volume, and regular energization is performed.

[0078] Although the bleeding output port to the rotary-valve syringe 18 is performed from the abbreviation bottom of a tank, it formed the strainer 630 here and has prevented foreign matter mixing to the rotary-valve syringe 18 (or urine sugar sensor 28 of the point). Furthermore, it is mostly prepared in the upper part, and this bleeding output port can also perform exchange of a strainer 630 easily, when [of the drain 210 established in the tank lower part] a drain 210 is removed. Moreover, since it is lower than other portions of a bottom, even when the residue of liquid decreases, it is easy to **** this drain 210 portion.

[0079] In addition, although the proofreading liquid tank 24 and the buffer-solution tank 26 were used as another object in the above example, this does not necessarily need to be taken as another object. For example, of course, it is also possible to divide a single tank into two rooms at the rate of a volume ratio suitably, and to use the integrated tank which prepares a liquid supplement mouth in the upper part of each locus, respectively, and grows into it instead of the two above-mentioned tanks. Since the purity of proofreading liquid and the buffer solution influences direct measurement precision, it is necessary to manage it enough.

[0080] However, at the time of a liquid-sending change, since a urine sample, proofreading liquid, and the buffer solution are sent into a sensor one by one through the rotary-valve syringe 18, although it is a minute amount, when a possibility that other liquid may blend is in the tanks 24 and 26 of proofreading liquid and the buffer solution and it is piled up on them, there is a problem of dropping the accuracy of measurement. Negative pressure occurs on a tank by suction at the time of liquid sending, and liquid becomes easy to flow backwards in a tank with this negative pressure.

[0081] Moreover, there is also a possibility that liquid may flow backwards in a tank also by the emergency malfunction of a rotary-valve syringe. Anyway, it is not desirable that the once sent-out liquid flows backwards to a tank again. Then, as the antisuckback section which prevents the adverse current of liquid between the rotary-valve syringe 18 which is the liquid-sending change section, and the proofreading liquid tank 24 and the buffer-solution tank 26, and a concrete example, the check valve is prepared in the piping tube.

[0082] When it pays its attention only to negative pressure prevention of a tank, you may prepare the hole and valve portion material which cancel the negative pressure in a tank in the part or the liquid inlets 242 and 262 (containing caps 241 and 261) of a tank.

[0083] Drawing 19 is the block diagram showing the electric composition of urinalysis equipment 10 centering on a controller 36. The controller 36 is constituted as a logic operation circuit centering on a microcomputer. in detail CPU362 which performs various data processing for controlling rotary-valve drive-motor 20 grade according to the control program set up beforehand, the timer to build in, ROM364 in which a control program, control data, etc. required at CPU362 to perform various data processing were stored beforehand, RAM366 by which various data required to perform various data processing by CPU362 similarly are written temporarily, The input-process circuit 368 which inputs the detecting signal from the various above-mentioned sensors (for example, electrode 34), and the signal from the various switches of a control unit 38, and is changed into the signal which can process CPU362, It responds to the result of an operation in CPU362. The rotary-valve drive motor 20, the syringe drive motor 22, the urine test arm drive motor 23, the terminal 114 for communication It has the output-processing circuit 380 grade which outputs a driving signal to for example, (baud rate:2400bps, character length:8bit, parity:even, stop bit:1, code:ASCII, level:RS232C), and display 39 grade. Moreover, even when the controller 36 is equipped with the non-volatile memory (EEPROM367) for memorizing storage and the contents of trouble detection of data etc. and a power supply is shut off, the memorized contents do not disappear.

[0084] In addition, although it explained having the data storage section in the measurement unit 11, it stores data in this storage and may be made for what was indicated by this example to read data from the communication terminal 114 of the measurement unit 11 using another storage (for a floppy disk to be begun and for them to be CDROM and an IC card), and to be made to it as a cellular phone being possible.

[0085] Since the drive for storage can be miniaturized especially in the case of an IC card, effectiveness is very high. And data can be dropped on a personal computer from these storages, and it can also use for synthetic healthy management by using it with the software (this being also good also as what can be downloaded from a measurement unit) of exclusive use, and adding various living information including the individual contents of a meal.

[0086] Next, the operation from which the communication terminal 114 is different is explained. In order to carry out communication with the exterior to the side of the measurement section 11, the communication terminal 114 is attached. This terminal is using D sub connector so that a general device and general connection may be possible (refer to drawing 42). The first use use is outputting to the measurement section 11 shell exterior. The second use use is an input to the measurement section 11 from the outside.

[0087] Here, about the first use use, non-volatile memory etc. is made to memorize the contents which line inspection checked, a personal computer is connected afterwards, and the inspection result in a line is outputted. Moreover, when it breaks down, after taking over the check in a site and this equipment which non-volatile memory etc. is made to memorize the contents of failure, and are installing them, it is possible to output the contents of failure. Moreover, as another use, from a printer, the measurement result memorized in the measurement section 11 can be summarized, make it write, and the direct file of the printer is carried out to D sub connector, and the list and graph of a measurement result can be carried out [a measurement result can be made to be able to output for every measurement, or / it is sufficient and]. Moreover, the measurement result memorized in the measurement section 11 is collectively outputted to a personal computer, and this result can be analyzed now in a personal computer. Furthermore, the adapter for external communication can be attached in a measurement section main part, and measurement information can be transmitted to somewhere else.

[0088] Next, it is in inputting a model code about the second use use. Although a model code may be registered at the time of shipment, it can also be tied and changed into an on-site personal computer according to the purpose. Moreover, the contents of specification change can be written for the contents of specification change of this equipment in the non-volatile memory of this equipment from a personal computer, and use of equipment can be changed. For example, when there is change of the use life of a sensor, the information on a sensor life can be rewritten from a personal computer, and it can be made the equipment of another specification.

[0089] Even if current supply is temporarily cut off by power failure etc. since it has the backup power supply 670 for example, a timer does not shift.

[0090] Furthermore, the capacity of a backup power supply 670 is variously considered by operation which backs up when current supply is cut off temporarily. For example, if it is the small power about [above-mentioned] a timer, it is good at an electrolytic capacitor (super capacitor).

[0091] Moreover, when current supply is cut off temporarily working [equipment] and you are going to make it work to the last for equipment protection of the operation, comparatively big power capacity is needed. In such a case, a cell is good.

[0092] In addition, when this cell is the type which can charge during energization usually, a maintenance becomes unnecessary and it is user-friendly.

[0093] About the motor which drives the urine test arm 32 and rotary-valve syringe 18 grade, although especially a kind is not limited, using a property top stepping motor explains it below preferably especially.

[0094] About the urine test arm drive motor 23, it usually drives by 2 phase excitation method. the usual **** -- about carrying out receipt operation and position appearance, it drives by a certain constant speed In this case, although the drive speed (for example, 200pps(es)) has the quicker desirable one because of shortening of the measuring time, in tuning an arm position finely on the other hand, a use kitchen's driving at a speed (for example, 100pps(es)) later than this improves.

[0095] The urine test arm 32 in a stowed position causes a position gap by vibration by the seat 102, the switching action of the facilities cover 104, or taking a seat and **** operation of a user at the time of receipt. Since a position gap is caused with a urinary shock etc. and it becomes impossible to extract urine well as a result when ****(ing) and collecting urine in a toilet bowl otherwise, at the time of receipt of the urine test arm 32, and urine test, a controller 36 controls to perform position maintenance by impressing maintenance voltage to the urine test arm drive motor 23 (by for example, 1 phase excitation). In this way, since the urine test arm 32 suits the effect of the position broth mentioned above, and it waits for it and it is controlled very correctly, it can collect urine certainly.

[0096] In this case, in order to waste power by always impressing maintenance voltage, maintenance voltage impression is controlled according to the output of the human body detection sensor 260.

[0097] Specifically, when the human body detection sensor 260 detects people, the above-mentioned position gap can be lost by making the urine test arm 32 drive in the receipt direction. Moreover, when the human body detection sensor 260 detects what people left, by stopping the energization to the urine test arm drive motor 23, waste of power can be prevented and it is still more desirable.

[0098] The rotary-valve drive motor 20 and the syringe drive motor 22 are explained continuously.

[0099] It is only carrying out adjustable [of the pulse rate impressed to a stepping motor], the drive speed, i.e., various kinds of liquid-sending speed, of the syringe drive motor 22, and it can be made to change easily and certainly by using

a stepping motor, without carrying out complicated control. It is very effective to have the means which carries out adjustable [of the drive speed of the piston 168 in the rotary-valve syringe 18], and it explains according to this example.

[0100] For example, when washing the inside of a cylinder 166, and a piping path, it drives by the first high-speed pulse rate (for example, 100pps(es)). Time required for washing can be lessened by driving at high speed.

[0101] On the other hand, when sending a urine sample and proofreading liquid in the urine sugar sensor 28, it drives by the second low-speed pulse rate (for example, 20pps(es)), and the accuracy of measurement can be raised.

[0102] Moreover, it is necessary to manage very correctly the amounts of liquid sending, such as urine sent to the urine sugar sensor 28 in measurement, and proofreading liquid, the buffer solution (for the sensor and liquid suitable for it to be used when measuring except urine sugar). These managements are attained by using a stepping motor for the rotary-valve drive motor 20 and the syringe drive motor 22.

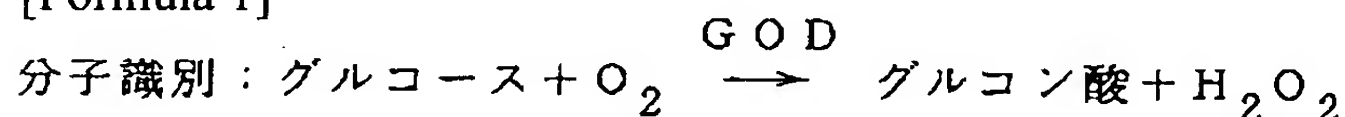
[0103] In addition, the motor during starting of all said stepping motors is in phase from the pulse stopped last time, and starts excitation. Moreover, at the time of reversal, the seal of approval of the pulse number for absorbing the play of a gear or others is added and carried out. As for especially the required rotary valve and required syringe of strict position control, it is very effective to perform these control, and it becomes possible to control with a very sufficient precision.

[0104] Then, the urine sugar sensor 28 is explained. The urine sugar sensor 28 is arranged in the position where potential energy is higher than the conveyance tube 150 and a tube 152 so that a liquid may not leak, even if the urine sugar sensor 28 is removed, when the conveyance tube 150 or the tube 152 is filled up with the liquid.

[0105] The urine sugar sensor 28 uses the detection principle (a ** type view is shown in drawing 20 (a)) mentioned later. That is, very many chemical species are included in the urine which is the wastes of life activity. Although the urine sugar as used in the field of this invention points out a glucose (grape sugar), when being mostly discharged by the diabetic etc., of course in healthy people, compared with other components, for example, urea, and ammonia, concentration is quite low. Therefore, the urine sugar sensor 28 needs to be equipped with both the function as a probe to discriminate a glucose specifically out of many components, and the function as a transducer which changes it into an electrical signal. By the urine sugar sensor 28, the hydrogen peroxide electrode is used as a transducer using the glucose oxidase (GOD) which is the enzyme which oxidizes a glucose specifically as a probe. A detection reaction is shown below.

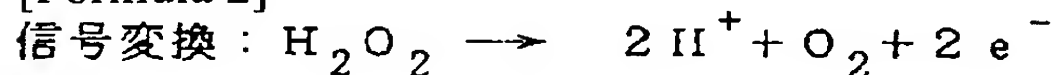
[0106]

[Formula 1]



[0107]

[Formula 2]



[0108] Moreover, a uric acid and an ascorbic acid react, and a hydrogen peroxide electrode gives outputs other than the two above-mentioned formulas, and causes a measurement error. In order to avoid it, the permselective membrane which penetrates only a hydrogen peroxide with small molecular weight alternatively is formed between the molecule discernment section and the signal transformation section.

[0109] Now, as shown in drawing 20 (b), on the occasion of the quantitative analysis of the glucose in a urine sample, the current which flows between the operation pole 135 and counter electrodes 137 (Ag) so that the potential of the operation pole 135 (Pt) to the reference pole 133 (Ag/AgCl) may become positive constant value (for example, +0.6V) changes with potentiostats 130 according to the yield of a hydrogen peroxide. Therefore, by detecting the current which flows between the operation pole 135 and counter electrodes 137, the yield of a hydrogen peroxide can be detected and the glucose concentration in a urine sample can be calculated based on this. The current which flows between the operation pole 135 and counter electrodes 137 is transformed into the potential difference by resistance 132, and the potential difference is amplified by the amplifying circuit 134 and outputted from the output terminal 136. The output of an output terminal 136 is inputted into the input-process circuit of a controller 36, and is used for the operation of glucose concentration.

[0110] It measures, after measuring, the solution, i.e., the proofreading liquid, containing the glucose of known concentration, and clarifying the proportionality constant of the variation of glucose concentration and current value before sample measurement generally.

[0111] While stabilizing the potential of the reference pole 133 to the buffer solution, buffers, such as KCl, and NaCl, a

phosphoric acid which function also as a supporting electrolyte, are dissolved in it. Although potential change of the reference pole 133 accompanying change of Cl ion concentration becomes small so that Cl ion concentration contained in the buffer solution is high concentration, using deep salting-in liquid not only leads to a cost rise, but there is a fault that a salt becomes easy to deposit, at the time of dryness and low temperature.

[0112] Then, the buffer solution which usually added KCl, NaCl, a phosphoric acid of about dozens of mM, etc. has been used. However, since Cl ion concentration in urine was not fixed (for example, a normal distribution like drawing 21 is shown), it needed to be made for Cl ion concentration of a solution which fully dilutes a sample and contacts the reference pole 133 as a matter of fact to become equal to Cl ion concentration of the buffer solution. It is because it becomes impossible to measure correctly the current based on the hydrogen peroxide which the potential of the reference pole 133 was changed, and the current which flows between the operation pole 135-counter electrodes 137 was changed, and was generated from the glucose when dilution is not enough.

[0113] In measuring by the conventional flow method, in order to gather the dilution scale factor of the sample by the buffer solution, the method of lengthening piping from the method of lessening the amount of placing of a sample or a sample placing portion to a detecting element, or reducing liquid-sending speed, and earning the time for dilution has been taken.

[0114] However, in the urinalysis equipment especially installed in the toilet of ordinary homes, it is difficult in a sample accuracy and to carry out slight amount preparative isolation, and if piping length tends to be lengthened and it is going to earn the time for dilution, it has the time which wastes a lot of buffer solutions upwards, and measurement takes, and the fault of becoming long.

[0115] Then, exact measurement is enabled, saving the amount of the buffer solution used for diluting a urine sample with using the buffer solution and proofreading liquid which added KCl or NaCl, a phosphoric acid, etc. which were doubled with average Cl ion concentration which exists in urine, and the time to a measurement end.

[0116] They are drawing 22 (a) and the measurement data which showed the relation between Cl ion and current value which carried out (b) above. Since reference pole 133 potential will fall quickly when a urine sample arrives at the reference pole 133 if the glucose in the urine containing a lot of Cl ion is measured using the buffer solution of KCl concentration 50mM, a rapid reduction of current value takes place. It continues and a hydrogen peroxide is generated by operation of GOD supported on the operation pole 135 from the glucose in urine, and the generated hydrogen peroxide oxidizes on the operation pole 135, and produces the oxidation current of a hydrogen peroxide. This is shown in drawing 22 (a). In order to start these reactions almost simultaneous, it cannot measure correctly only the oxidation current of the hydrogen peroxide corresponding to the glucose precision in urine, but the accuracy of measurement gets worse.

[0117] On the other hand, since the fall of reference pole 133 potential is very small when the buffer solution of KCl concentration 170mM is used, only the oxidation current of a hydrogen peroxide can be measured correctly. This is shown in drawing 22 (b).

[0118] Although Cl ion concentration in urine changes with the contents of a meal, or the situations of movement, as for the KCl concentration added to the buffer solution, it is desirable that it is the range of 170 ± 80 mM (1sigma) which is the average of Cl concentration in urine. The salt to add may be mixed NaCl other than KCl, and, as for it, these may be mixed to a pan. By furthermore adding the buffer solution and the salt of this concentration also in proofreading liquid, the accuracy of measurement can be raised further.

[0119] This method is widely utilizable not only for a flow method but the biosensor of an AMPERO metric method using the enzyme which is effective also in measurement of a batch method and generates an electrode activity object. Even if it does not gather a dilution scale factor so much, exact measurement is possible, and shortening of piping length or the measuring time can be aimed at.

[0120] Next, a control unit is explained in detail using drawing 23 .

[0121] The Light Emitting Diode 395 grade is prepared in the control unit 38 during the man switch 381, the woman switch 382, the cancellation switch 383, storage / call switch 384, the A-D switch 385, the cleaning mode switch 386, Light Emitting Diode 396 of A-D, the present time switch 387, the power-saving time switch 388, the regulation switch 389, the urine sugar sensor exchange Light Emitting Diode 394, and preparation.

[0122] although not illustrated in the front face of the various switches of a control unit 38, irregularity is prepared in it so that a switch can be specified, a switch can be discriminated clearly, and it is considered so that it may become what boils markedly and it is easy to operate. Discernment of a switch may attach not only irregularity but the colored light according to a switch individual. Moreover, a user is able to change the size and configuration of a switch and to enable it to specify.

[0123] In addition, although not illustrated in this example, various kinds of configuration switches with operating frequency low since it is the same may separate a few from an operation switch with much operating frequency, and

may install, you may cover with a cover, and a user is not bewildered by much switch in this case.

[0124] The fluorescent display 391 is equipped with time display 391b which displays character representation section 391a and time which display the character string of a maximum of 4 figures which consists of a number, an alphabetic character, a sign, etc. Under character representation section 391a, as shown in drawing 23, 3 figures can consist of seven luminescence segments, respectively, and can display others, alphabetic characters "E", signs "-" (hyphen), etc. from 0 to 9. [number] Moreover, 1 figure of the most significant can consist of two luminescence segments, and can display a number "1." As for a number, it is more desirable to consider as the luminescence segments from 0 to 9. Moreover, the above luminescence segments are used also for time display 391b. Although the present time (at the moon, a day, the time part) is usually displayed on time display 391b, when the present time switch 387 or the power-saving time switch 388 is pushed, it becomes time setting mode. If the regulation switch 389 is operated at the time of time setting mode, a time display will change according to it. Moreover, when the abnormalities (error) of a device occur, the alphabetic character "E" which shows abnormalities, and its number will be shown.

[0125] moreover -- this example -- comparatively -- a low cost -- in addition -- and although the fluorescent display is used since it says clearly that it is bright and is legible, of course, an electrochromatic display etc. may be prepared and a display variation can also be increased (not shown) It is not restricted to the content described above also about the content to display.

[0126] In addition, if transition of the explanation display an operating instruction's, the present operating state, measurement data, and each people's old data and directions of healthy management are displayed, it will become very desirable for a user. If an explanation indication of an operating instruction is given, it can be used feeling easy intelligibly also for the user and elderly people who use it for the first time. Moreover, failure does not occur by the operation mistake or incorrect data are not offered.

[0127] A user seems not to become uneasy at the latency times, such as under data collection, since a user knows what the inspection machine is carrying out, if it displays an operating instruction or displays that the present operating state mentioned above, since it is considering as the main use using the urinalysis equipment of this invention alone in a toilet unlike the case where it inspects in a hospital etc. About the data to display, it can make full use of the picture of not only a character but drawing, a graph, a person, etc. for advice of transition of old data, the easy comment about data, or healthy management, and a user will wipe away the dark image of inspection and it not only displays the measurement data of a time now, but he can do healthy management happily.

[0128] If it is an electrochromatic display, these various information can be told to a user, and if the switch of a control unit also becomes unnecessary by adopting the touch panel which unified the control unit 38 and the display 39 further and this space is utilized for a display 39, big screen-ization of a display 39 can be attained and it will very be easy to operate it.

[0129] Although already stated, although the control unit 38 and the display 39 are not shown in drawing of this example, it is not necessary to fix and install them especially in an inspection unit, and it has live part and a power supply section, and they are [it is good also as removable and] good also as remote control equipped with infrared light means of communications.

[0130] In addition, if the luminescence segment used for the fluorescent display 391 is used for a long period of time, according to each operating frequency, dispersion will produce it at brightness or lighting speed. Since dispersion on such a property is made as small as possible, operation of carrying out predetermined-time (for example, for several seconds) lighting of all the luminescence segments all at once can also be performed periodically. You may use a screen saver, in order to prevent degradation also in liquid crystal.

[0131] Following storage judgments and processings are performed to Light Emitting Diode 396 of A-D arranged near the A-D switch 385. That is, in making a measurement result memorize, it memorizes a measurement result by A-D Light Emitting Diode 396 of the pushed switch lighting up to a display 39, and pushing storage / call switch 384 on it, when the A-D switch 385 is pushed "during a measurement result display (Step S426 of drawing 26 mentioned later or subsequent ones)." Moreover, the position of the urine test arm 32 at the time of urine test can also be doubled and memorized.

[0132] By pushing a different A-D switch 385 from the A-D switch 385 pushed previously, before deciding storage, a measurement result is memorizable anew. In addition, if the cancellation switch 383 is pushed or predetermined-time (for example, 5 minutes) progress is carried out, it will disappear.

[0133] In calling the already memorized measurement result, if storage / call switch 384 is pushed while Light Emitting Diode 395 blinks, A-D Light Emitting Diode 396 will blink altogether waiting (after the measurement-setup end of the next time of Step S650 of drawing 24 mentioned later), or during preparation. If either of the A-D switches 385 arranged near A-D Light Emitting Diode 396 which is blinking is pushed, it displays, and Light Emitting Diode of the pushed switch will be turned on and Light Emitting Diodes other than the pushed switch will switch off the time

(henceforth data etc.) which memorized the newest data and newest data which were memorized by the pushed switch. Data can be made to scroll with the regulation switch 389.

[0134] A push on a different A-D switch 385 from the A-D switch 385 which called the memorized data and was previously pushed on inside displays the data memorized on the switch pushed anew. Under the present circumstances, Light Emitting Diode which turned on Light Emitting Diode of the pushed switch and had been turned on previously puts out the light.

[0135] In addition, a result display will disappear, if predetermined-time (for example, 5 minutes) progress is carried out or it pushes the cancellation switch 383.

[0136] In order to eliminate the memorized data, storage / call switch 384 is pushed, next one switch 385 of the A-D is pushed. What is necessary is to make data scroll and just to push storage / call switch 384 3 seconds or more continuously with the regulation switch 389. In addition, a result display will disappear, if predetermined-time (for example, 5 minutes) progress is carried out or it pushes the cancellation switch 383.

[0137] By for example, the thing for which the A-D switch 385 is pushed instead of pushing the man switch 381 and the woman switch 382 at the time of next measurement, when the position of data and the urine test arm 32 is stored in the A-D switch 385 by the above-mentioned operation If it is made to memorize on the A-D switch 385 which was made to **** the urine test arm 32 in the position memorized by the A-D switch 385, and pushed the result after measurement automatically Operation can be simplified and it is not necessary to wait on that occasion to the result display (the A-D switch 385 after performing the man switch 381, the woman switch 382, and the storage operation mentioned above is hereafter considered as "Measurement SW").

[0138] Next, it explains, referring to drawing 24 about the program test-for-glucose-in-urine processing performed by the operation 36 of the urinalysis equipment 10 constituted in this way, i.e., the controller of urinalysis equipment 10.

[0139] A plug or a short circuit protection plug (refer to drawing 10) is inserted in a plug socket, and when a power supply is switched on, a flow like drawing 18 is followed. After initial operation (Step S100), by the present time set judgment (Step S110), the shift to pump-priming operation (Step S120) to a pump 16 is judged, position **** of each motor (the rotary-valve drive motor 20, the syringe drive motor 22, urine test arm drive motor 23) is performed (Step S150), and piping restoration (Step S200) is carried out. And proofreading liquid is attracted (Step S350) and this is measured (Step S400). Under the present circumstances, a sensor output is incorporated to CPU362 and Gain (amplification degree of a sensor output) is set up. Washing in the urine test arm 32 and a syringe 18 (Step S450) is performed after that. After carrying out empty length (Step S500) after washing and discharging a wash water, restoration (Step S550) of an exhaust pipe 186 and sensor pipe restoration (Step S600) are performed, and a measurement setup (Step S650) is completed next time, and it will be in a standby state.

[0140] If Measurement SW is turned on and measurement is started, after being judged with "measurement" by proofreading / measurement judgment (Step S700) and performing urine measurement (Step S750), proofreading liquid suction (Step S350) is performed, and proofreading liquid measurement (Step S400) is performed. After that, washing (Step S450), empty length (Step S500), exhaust pipe restoration (Step S550), and sensor pipe restoration (Step S600) are performed one by one, and it shifts to a measurement setup (Step S650) next time.

[0141] Next, each step mentioned above is explained in detail.

[0142] Specifically with initial operation at Step S100, it goes on in the way shown in the flow chart of drawing 25 . RAM366 is checked and this is cleared (Step S102). After carrying out fixed time (for example, 2 seconds) lighting (Step S104) of the fluorescent display and all Light Emitting Diodes of a display 39, it reads by checking and restoring the write-in content of non-volatile memory EEPROM367 (Step S106) (Step S108). As a content read from EEPROM here, the data about the life of a sensor, the sensor resistance welding time, the total resistance welding time of a controller 38, a sensor turnover rate, a freeze history, the existence of other safeguards operation, etc. are raised. Step S114 and Step S116 which detect the judgment (Step S110) of being freeze history owner ** and the tank residue of a judgment (Step S112) and the proofreading liquid of whether it carries out by coming out and there is an urine sugar sensor 28, or the buffer solution for proofreading liquid, the buffer solution, or the freeze existence information on various piping are performed continuously, and the sensor life detection function check a sensor life is operated -- making (Step S118) -- it carries out in addition, various detection operation -- being negative (abnormalities etc.) -- although it shifts to safe operation of a product, and operation which performs the display of abnormalities when judged, it does not state for details here

[0143] With each motor position **** in Step S150 **** and receipt of the urine test arm 32 specifically shown in the flow chart of drawing 26 are the point and according to the urine test arm drive motor 23 (Step S152), By performing positive and reverse rotation of the rotary valve by the rotary-valve drive motor 20 (Step S154), and elevation and descent of the syringe by the syringe drive motor 22 (Step S156) the urine test arm drive motor 23, the rotary-valve drive motor 20, and the syringe drive motor 22 -- dashing -- etc. -- it is positioning and making it move to an each

position

[0144] By the way, the upper surface of a toilet bowl is equipped with the urine test unit 12 equipped with the urine test arm drive motor 23 to motors other than urine test arm drive-motor 23 being built in the measurement unit 11 deferred above the floor level among each above-mentioned motor, and in case a user rotates the seat 102 and the facilities cover 104, the position of the urine test arm 32 may shift. for this reason, it is desirable to face above-mentioned to carry out position appearance, and to perform carefully position **** of the urine test arm drive motor 23

[0145] With piping restoration at Step S200, specifically Water is attracted in the way shown in the flow chart of drawing 27 (a port 174 is open for free passage with a water port with Rota 180). A piston 168 descends to about 1/2, and attracts water in a cylinder 166 (Step S204). Exhaust pipe 186 restoration (a port 174 is open for free passage with exhaust pipe 186 port with Rota 180) A cylinder 166 goes up to the topmost part, and are filled up with water in an exhaust pipe 186 (Step S208). The judgment (Step S214) of buffer-solution level >L, sensor pipe restoration (a port 174 is open for free passage with a buffer-solution port with Rota 180) A piston 168 descends to about 1/2, and attracts the buffer solution in a cylinder 166. Then, it is the thing which a port 174 is open for free passage with conveyance tube 150 port with Rota 180, and a piston 168 goes up to the topmost part, and are filled up with the buffer solution in conveyance tube 150 and a tube 152 and to do (Step S216). In addition, in Step S214, when a negative judgment is made, the buffer-solution supplement Light Emitting Diode 392 is turned on.

[0146] With proofreading liquid suction at Step S350, specifically At the point shown in the flow chart of drawing 28 , it is proofreading liquid suction (a port 174 is open for free passage with a proofreading liquid port with Rota 180). A piston 168 descends to about 1/8, and attracts proofreading liquid in a cylinder 166 (Step S354). It is carrying out surplus liquid eccrisis (a port's 174 being open for free passage with a urine test port with Rota 180, a piston's 168 going up to the middle of the downward position mentioned above and the topmost part, and the proofreading liquid in a cylinder 166 being discharged) (Step S358).

[0147] In addition, the foam which was made to carry out the number step descent of the piston 168, and has adhered near the conveyance tube 150 port before proofreading liquid suction of Step S354 mentioned above (a port 174 is open for free passage with conveyance tube 150 port with Rota 180, and a piston 168 goes up to the topmost part) may be made to attract, and the buffer solution containing the foam may be thrown away into an exhaust pipe 186.

[0148] With proofreading liquid measurement at Step S400, specifically In the way shown in the flow chart of drawing 29 , the proofreading liquid attracted in the cylinder 166 at Step S402 is discharged (an exhaust pipe 186 opens a port 174 for free passage with the connected eccrisis port by Rota 180). A piston 168 goes up. proofreading liquid Little eccrisis (Step S402), Proofreading liquid placing (a port 174 is open for free passage with a sensor port with the low evening 180) A piston 168 goes up and drives proofreading liquid into the conveyance tube 150 (Step S404). Surplus proofreading liquid eccrisis (a port 174 is open for free passage with a urine test port with Rota 180) A piston 168 goes up to the topmost part, and discharges proofreading liquid (Step S406). 1st syringe washing (a port 174 is open for free passage with a water port with Rota 180) A piston 168 descends to about 1/4, and attracts water in a cylinder 166. Then, a port 174 is open for free passage with a urine test port with Rota 180, and a piston 168 goes up to the topmost part. They are eccrisis (Step S408) and the 2nd syringe washing (a port 174 is open for free passage with a water port with Rota 180) about the water in a cylinder 166. A piston 168 descends to about 1/4, and attracts water in a cylinder 166. Then, a port 174 is open for free passage with a urine test port with Rota 180, and a piston 168 goes up to the topmost part. They are eccrisis (Step S410) and buffer-solution suction (a port 174 is open for free passage with a buffer-solution port with Rota 180) about the water in a cylinder 166. A piston 168 descends to about 1/3, and attracts the buffer solution in a cylinder 166 (Step S414). Bubble omission (a port 174 is open for free passage with an eccrisis port with Rota 180, and a piston 168 goes up) The buffer solution Little eccrisis (Step S418) and base voltage adjustment (Step S420), It displays as a result of proofreading liquid transport liquid (a port 174 is open for free passage with a sensor port with Rota 180, a piston 168 goes up, and even the urine sugar sensor 28 sends urine with the buffer solution) (Step S422), and an operation (Step S424) (Step S426).

[0149] However, when judged with "measurement" by proofreading / measurement judging (Step S700), in the operation (Step S424) mentioned above, "concentration of the concentration =(output to output/proofreading liquid to sample) x proofreading liquid of a device under test" is performed, and it carries out to a result display (Step S426) after that.

[0150] on the other hand, when judged with "proofreading" by proofreading / measurement judging (Step S700), in the operation (Step S424) mentioned above, it performs "incorporating a sensor output to CPU362 and setting up Gain (amplification degree of a sensor output)", and ends (a result -- a display -- not carrying out)

[0151] Immediately after making a port 174 open for free passage with a sensor port by Rota 180 at the time of the liquid-sending start of proofreading liquid transport liquid (Step S422), number step elevation of the piston 168 may be

carried out at a quick speed (for example, 100PPS(s)), and the foam in the urine sugar sensor 28 may be discharged to a tube 152 with the buffer solution in the conveyance tube 150.

[0152] With washing at Step S450, specifically In the way shown in the flow chart of drawing 30 , pump-on (Step S452), Surplus buffer-solution eccrisis (a port 174 is open for free passage with a urine test port with Rota 180) A piston 168 goes up to the topmost part, and discharges the buffer solution in a cylinder 166 (Step S454). Water suction (a port 174 is open for free passage with a water port with Rota 180, and a piston 168 descends to the lowest edge) They are suction (Step S456) and water eccrisis (a port 174 is open for free passage with a urine test port with Rota 180) about water in a cylinder 166. A piston 168 goes up to the topmost part, and discharges the water in a cylinder 166 (Step S458). Water suction (a port 174 is open for free passage with a water port with Rota 180, and a piston 168 descends to the lowest edge) They are suction (Step S460) and water eccrisis (a port 174 is open for free passage with a urine test port with Rota 180) about water in a cylinder 166. A piston 168 goes up to the topmost part, and is eccrisis (Step S462) and little pumping (a port 174 is open for free passage with a water port with Rota 180, and a piston 168 descends to about 1/3, and carries out little suction of the water into a cylinder 166.) about the water in a cylinder 166. Then, a port 174 is open for free passage with a urine test port with Rota 180. In this state, a piston 168 repeats twice reciprocating movement of descending to about 1/3 again once it goes up to the topmost part. This moves reciprocally the inside of the passage which the water of the above-mentioned small quantity reaches to the urine test arm 32. Water suction by which this passage is washed (Step S464) (a port 174 is open for free passage with a water port with Rota 180) A piston 168 descends to the lowest edge and attracts water in a cylinder 166 (Step S466). It is water eccrisis (a port's 174 is open for free passage with a urine test port with Rota 180, a piston's 168 goes up to the topmost part, and the water in a cylinder 166 is discharged) (Step S468), and carrying out a pump off (Step S470).

[0153] With the empty length by Step S500, specifically At the point shown in the flow chart of drawing 31 , it is air suction (a port 174 is open for free passage with a urine test port with Rota 180). A piston 168 descends to the lowest edge and attracts air in a cylinder 166 (Step S502). (the water in the conveyance tube 76 is also attracted simultaneously) Discharge (a port 174 is open for free passage with exhaust pipe 186 port with Rota 180) A piston 168 goes up to the topmost part, and discharges the air and water in a cylinder 166 (Step S504). Air suction (a port 174 is open for free passage with a urine test port with Rota 180) A piston 168 descends slowly to the lowest edge, and attracts air in a cylinder 166 (Step S506). (the water in the conveyance tube 76 is also attracted simultaneously) It is discharging (Step S508) (a port's 174 being open for free passage with a ** port with Rota 180, a piston's 168 going up to the topmost part, and the air and water in a cylinder 166 being discharged).

[0154] With exhaust pipe restoration at Step S550, specifically At the point shown in the flow chart of drawing 32 , it is water suction (a port 174 is open for free passage with a water port with Rota 180). A piston 168 descends to the lowest edge and attracts water in a cylinder 166 (Step S552). It is carrying out water restoration (a port's 174 being open for free passage with exhaust pipe 186 port with Rota 180, and a piston's 168 going up to the topmost part, and filled up with water in an exhaust pipe 186) (Step S554).

[0155] With sensor pipe restoration at Step S600, specifically In the way shown in the flow chart of drawing 33 , the judgment of proofreading liquid level >L (Step S601), The judgment (Step S602) of buffer-solution level >L, buffer-solution suction (a port 174 is open for free passage with a buffer-solution port with Rota 180) A piston 168 descends to about 1/2, and attracts the buffer solution in a cylinder 166 (Step S604). It is the thing to the judgment (Step S606) of buffer-solution level >L, bubble omission (a port 174 is open for free passage with exhaust pipe 186 port with Rota 180, a piston 168 goes up, and it is little eccrisis about the buffer solution) (Step S608), and the urine sugar sensor 28 to send (Step S610).

[0156] In addition, the foam which remains the piston 168 near the number step pull back ***** tube 150 port may be attracted after the sensor pipe restoration (Step S600) mentioned above, and the buffer solution containing the foam may be thrown away into an exhaust pipe 186.

[0157] specifically, the next measurement setup in Step S650 is the point shown in the flow chart of drawing 34 , carries out piston position appearance (elevation of the syringe by the syringe drive motor 22) (Step S652), and are piston lock prevention (descent of the syringe by the syringe drive motor 22) (Step S654), and carrying out the Rota position appearance (reverse and positive rotation of the rotary valve by the rotary-valve drive motor 20) (Step S656), and carrying out

[0158] Proofreading / measurement judging at Step S700 is specifically the point shown in the flow chart of drawing 35 , and is CPU-362-reset-state-judging (Step S702), and carrying out a measurement SW ON judging (Step S706).

[0159] With urine measurement at Step S750, specifically the point shown in the flow chart of drawing 36 and drawing 37 -- the judgment (Step S752) of man switch 381 ON, if it carries out **** (Step S754) of the urine test arm 32 is carried out to a man position (refer to drawing 2). by the judgment (Step S756) of ***** (urinary ** is detected by the electrode 34 with which the urine test arm 32 is equipped) Sample (urine) suction (Step S758) is performed, and the

urine test arm 32 is contained (Step S760). Then, surplus sample (urine) discharge (Step S762) is carried out. Then, the sample attracted in the cylinder 166 is discharged (an exhaust pipe 186 opens a port 174 for free passage with the connected discharge port by Rota 180). A piston 168 goes up. a sample Little discharge (Step S787), The usage-count life of a sensor is counted up sample placing (a port 174 is open for free passage with a sensor port with the low evening 180, a piston 168 goes up, and a sample is driven into the conveyance tube 150) (Step S788), and here (Step S789). Then, surplus sample discharge (a port 174 is open for free passage with a urine test port with Rota 180) A piston 168 goes up to the topmost part, and discharges a sample (Step S790). 1st syringe washing (a port 174 is open for free passage with a water port with Rota 180) A piston 168 descends to about 1/4, and attracts water in a cylinder 166. Then, a port 174 is open for free passage with a urine test port with Rota 180, and a piston 168 goes up to the topmost part. They are discharge (Step S791) and the 2nd syringe washing (a port 174 is open for free passage with a water port with Rota 180) about the water in a cylinder 166. A piston 168 descends to about 1/4, and attracts water in a cylinder 166. Then, a port 174 is open for free passage with a urine test port with Rota 180, and a piston 168 goes up to the topmost part. They are discharge (Step S792) and buffer-solution suction (a port 174 is open for free passage with a buffer-solution port with Rota 180) about the water in a cylinder 166. A piston 168 descends to about 1/3, and attracts the buffer solution in a cylinder 166 (Step S793). Bubble omission (a port 174 is open for free passage with a discharge port with Rota 180, and a piston 168 goes up) The buffer solution Little discharge (Step S794) and base voltage adjustment (Step S795), Sample liquid sending (a port 174 is open for free passage with a sensor port with Rota 180, a piston 168 goes up, and even the urine sugar sensor 28 sends urine with the buffer solution) (Step S796) and an operation (Step S797) are performed, and it ends.

[0160] By the operation (Step S797) mentioned above, operation which incorporates the output of the urine sugar sensor 28 to a urine sample to CPU362 is performed. On the other hand, when the ON judging of the woman switch 382 is carried out in Step S752 (refer to drawing 36), **** (Step S764) of the urine test arm 32 is carried out to a woman position (refer to drawing 2), and the urine test arm 32 is a regulation switch 389 ON judging (Step S766) after a halt, and carries out urine test arm fine control operation (Step S768) in a woman position.

[0161] Moreover, at Step S756, in not carrying out urine detection for after [urine test arm 32 ****] 1 minute, it contains the urine test arm 32 by progress judging (Step S770) for 1 minute (Step S772). (refer to drawing 2) Then, a measurement setup (Step S650) is performed washing (Step S450) mentioned above, empty length (Step S500), exhaust pipe restoration (Step S550), and next time, and it will be in a standby state.

[0162] When Measurement SW is turned on, voltage (0.6V) currently impressed to the urine sugar sensor 28 may be made into a low battery (0V) at the moment, it may return to applied voltage (0.6V) again, or except measurement operation, it is always made a low battery (0V), and is good as for applied voltage (0.6V) only at the time of measurement. (It mentions later for details) .

[0163] Drawing 38 is a flow chart which shows example of another of the urine test in urine measurement (Step S750). In this flow chart, after the urine test arm 32 **** to a predetermined position (a man position or woman position : refer to drawing 2), Step S782 for judging whether it canceled between predetermined times (for example, for 1 minute), and the switch 383 was turned on is formed. When urine was not detected in Step S756, and it cancels in Step S782 and ON of a switch 383 is not detected, it progresses to the judgment during 1 minute of Step S770.

[0164] On the other hand, when it cancels in Step S782 and ON of a switch 383 is detected, the urine test arm 32 is contained (Step S784), and it progresses to a predetermined-time (for example, 5 seconds) progress judging (Step S786). Here, it says that the elapsed time after a 5-second progress judging sets the urine test arm 32 to a predetermined position at Steps S754 or S764 judges whether it is 5 seconds or more. In Step S786, when judged with elapsed time being 5 seconds or more, a measurement setup (Step S650) is performed washing (Step S450) mentioned above, empty length (Step S500), exhaust pipe restoration (Step S500), and next time, and it stands by. On the other hand, if the above-mentioned elapsed time is judged to be less than 5 seconds, it will go into a standby state as it is.

[0165] In the example explained above, the sequence which performs more exact measurement in consideration of the sensor property mentioned later is proposed.

[0166] That is, after performing urine measurement (Step S750), it is the sequence which measures proofreading liquid immediately (Step S350 - Step S400), carries out the comparison operation of both, and displays a result.

[0167] Although drawing 20 (a) and (b) explained the detection principle and structure of the urine sugar sensor 28 which are used by this example, the property of this urine sugar sensor 28 is explained below. As mentioned above, Pt (platinum) is used as the quality of the material of the operation pole 135, and, as for the operation pole 135, fixed voltage (for example, voltage of 0.6V) is impressed to the reference pole 133 (refer to drawing 20 (b)).

[0168] If it continues impressing voltage to the operation pole 135, an electrode front-face top will oxidize gradually. Oxidization of an electrode front-face top reduces the sensitivity of the platinum to a hydrogen peroxide (refer to drawing 39).

[0169] That is, the glucose sensitivity (output) of the urine sugar sensor 28 falls. Therefore, although mentioned above, an error arises in a measurement result with the obstacle (for example, it will output a pseudopositiveness side to a sensor output by the uric acid, the ascorbic acid, etc.) contained in urine.

[0170] the enzyme film is also supported by the urine sugar sensor 28 -- having mentioned above (referring to drawing 20 (a)) -- since it tends to receive temperature effects since this enzyme film is protein, enzyme activity becomes low at the time of low temperature (for example, 0-10 degrees C) and the reaction of the hydrogen peroxide on the operation pole 135 also becomes blunt, a sensor output becomes small as a result (refer to drawing 40)

[0171] Conversely, at the time of an elevated temperature (for example, 30-40 degrees C), since enzyme activity becomes high and the reaction of the hydrogen peroxide on the operation pole 135 also becomes good, a sensor output becomes large as a result (refer to drawing 40).

[0172] Furthermore, an enzyme film loses activity gradually with the passage of time, and an output declines with time (not shown).

[0173] Therefore, since according to the measurement sequence mentioned above proofreading liquid is measured for a short time after carrying out urine measurement, it is not influenced of measurement environment (especially temperature), but high measurement of precision is always possible.

[0174] However, after carrying out urine measurement (Step S750) in this sequence, in order to calculate by performing proofreading liquid measurement (Step S350 - Step S400), time until it displays a result is long.

[0175] Before carrying out the depression of the measurement SW rather than performing proofreading liquid measurement (Step S350 - Step S400) after carrying out urine measurement (Step S750) in order to shorten the time to a display, as a result of describing above, it is good to perform proofreading liquid measurement (Step S350 - Step S400).

[0176] Drawing 24 is diverted and this sequence is explained in full detail. For example, when a plug or a short circuit protection plug is inserted in a plug socket and a power supply is switched on, after initial operation (Step S100), by the present time set judgment (Step S110), the shift to pump-priming operation (Step S120) to a pump 16 is judged, position **** of each motor (the rotary-valve drive motor 20, the syringe drive motor 22, urine test arm drive motor 23) is performed (Step S150), and piping restoration (Step S200) is carried out And proofreading liquid is attracted (Step S350) and this is measured (Step S400). Under the present circumstances, while incorporating a sensor output to CPU362 and setting up Gain (amplification degree of a sensor output), the output value is made to memorize as a calibration value. Then, washing in the urine test arm 32 and a syringe 18 (Step S450) is performed. After carrying out empty length (Step S500) after washing and discharging a wash water, restoration (Step S550) of an exhaust pipe 186 and sensor pipe restoration (Step S600) are performed, and a measurement setup (Step S650) is completed next time, and it will be in a standby state.

[0177] If it becomes measurement SW ON and measurement is started at the time of measurement, it will be judged with "measurement" by proofreading / measurement judgment (Step S700), and urine measurement (Step S750) will be performed. The sensor output at the time of measurement is calculated as compared with the sensor output (calibration value) memorized at the time of proofreading liquid measurement (Step S400). After that, washing (Step S450), empty length (Step S500), exhaust pipe restoration (Step S550), and sensor pipe restoration (Step S600) are performed one by one, and it shifts to a measurement setup (Step S650) next time.

[0178] if a difference is in the measurement environmental temperature when measuring the time of proofreading the urine sugar sensor 28, and urine since it was influenced by change of the sensor property (temperature dependence : refer to drawing 40) mentioned above although the time to a display was shortened as a result of the measuring time when it was the sequence mentioned above -- some -- coming out -- although it is, an error is produced in a measurement result

[0179] Since there is the feature (the advantage and demerit) in two sequences mentioned above, respectively, you may prepare a selecting switch (not shown) in a control unit 38 so that two persons may be made to choose according to a user's needs. Moreover, every predetermined time (every [for example,] 24 hours) and the method of proofreading for every (every [for example,] 20 times) predetermined usage count can also be taken using a timer means, a usage-count measurement means, etc. Furthermore, it is also possible to control to change this predetermined time according to the timing and measured value of the sensor exchange back or a power up. This control is explained in full detail below.

[0180] Proofreading is carried out by every predetermined-time 1 (for example, 2 hours) after powering on or urine sugar sensor 28 exchange. At this time, when there is a proofread value beyond a predetermined value as compared with the last output, it carries out by every predetermined-time 1 (2 hours) succeedingly, and when it is below a predetermined value, auto operation (automatic calibration) is carried out so that subsequent proofreading may be performed to every predetermined-time 2 [longer than a predetermined time 1] (for example, 24 hours). In this way, it

not only can lessen the amount of the proofreading liquid used, but proofreading time is shortened and it can compensate with-time degradation (refer to drawing 39) of the urine sugar sensor 28.

[0181] On the basis of a power up or the time of urine sugar sensor 28 exchange, although the time of automatic calibration is good, it may be made to perform automatic calibration at the time which the user set up at once on the 1st.

[0182] Moreover, it is still more desirable when it is made to perform automatic calibration based on the number of times of measurement in addition to the automatic calibration of the above scheduled time. For example, if the number of times of the measurement performed behind exceeds a predetermined value (for example, 20 times) after proofreading is performed last time, extraordinary automatic calibration will be performed, without waiting for the automatic calibration of the next scheduled time. When having memorized in the memory 367 nonvolatile about the number of times of measurement and a power supply is intercepted, storage is not lost and counting can be carried out certainly.

[0183] Then, the heating unit mechanism shown by this example is explained. The heating unit 250 which heats the urine sent by the urine sugar sensor 28 to the measurement unit 11 interior, proofreading liquid, etc. to an optimal temperature as shown in drawing 3 and drawing 16 , The temperature sensor 251 which detects solution temperature directly or indirectly, and the temperature sensor 261 which acts as the monitor of the temperature of the toilet interior of a room, although it mentioned above having formed the heating unit 236 which heats the inside of the measurement unit 11 or -- indirect -- for proofreading liquid or the buffer solution, and the temperature sensor 237 which detects this temperature, these are explained in full detail below

[0184] The heating units 236 and 250 mentioned above incorporate the signal from temperature sensors 237, 251, and 261 from the input-process circuit 368 in a controller 36 to CPU362, as shown in drawing 19 , they are outputting the result of an operation from the output-processing circuit 380, and feedback control is carried out.

[0185] Drawing 41 is the outline block diagram of the heating units 236 and 250 for warming the solution temperature installed in the conveyance tube 92,150 from the buffer-solution tank 26 to the urine sugar sensor 28, and temperature sensors 237 and 251. The conveyance tube 92,150 and heating units 236 and 250 are pinched with the good aluminum foil 263 of heat conduction etc., and adjoin. For heating space saving, when the conveyance tube 92,150 is constituted with a flection, it is desirable, is constituted in the shape of a cylindrical helix like drawing 41 (a), and is inserted with the good aluminum foil 263 of heat conduction. Heating units 236 and 250 are inscribed in the interior of the cylinder made from the conveyance tube 92,150 and aluminum foil 263 in the state where it was similarly inserted with aluminum foil 263. The precision of the solution temperature made to flow into the urine sugar sensor 28 can be raised by arranging a temperature sensor 251 near the heating unit 250 trailer connected with the urine sugar sensor 28.

[0186] If the conveyance tube 92,150 and heating units 236 and 250 are arranged on a flat-surface swirl and it constitutes on monotonous as shown in drawing 41 (b), it not only can attain thin shape-ization, but fixation, such as fixing to the case flat surface of for example, a measurement unit, will become easy. Moreover, not only solution temperature but the solution temperature of the urine sugar sensor 28 and the neighborhood can be warmed by making about 28 urine sugar sensor crawl.

[0187] In addition, although the advantage that configuration processing is easy to cost, a tubing heater, and a field-like exoergic means are desirable as heating units 236 and 250, it is also possible for it not to be limited to this but to use the heating element of a sheath heater, or an infrared heater and others.

[0188] Moreover, heating units 236 and 250 may not be formed specially, but ** may also be share-ized with other heat sources. For example, when combining with a toilet bowl warm water flush system etc., it is also possible to screw in the hot-water tank which is the heat source of a toilet bowl warm water flush system, and to carry out the combination ellipsis of the heating units 236 and 250.

[0189] The role of the heating unit mentioned above is explained below based on this example.

[0190] Although the temperature of the toilet interior of a room may fall at the night of winter etc. and a water pipe etc. may often cause a freeze, even when it not only may do damage to a tank or piping, but a freeze is caused and there is no damage, proofreading liquid and the buffer solution which were frozen at once will change the property. Although proofreading liquid is glucose solution (this example 200 mg/dl), once it freezes, even if it will thaw, it does not become the glucose concentration before a freeze.

[0191] Furthermore, the buffer solution is a phosphate buffer solution in which the salt called KCl and NaCl was contained, although mentioned above, and once it freezes, even if these melts will crystallize and thaw, it does not return to the buffer-solution composition before a freeze. For example, the temperature of the toilet interior of a room falls at night, the buffer solution and proofreading liquid are frozen, daytime comes after that, and when temperature rises and is thawed, the big change to measured value will produce an appearance top in what is completely changeless. That is, it becomes an unreliable value, without the ability performing exact measurement.

[0192] Moreover, although the property of the urine sugar sensor 28 was mentioned above, it is necessary to measure under proper measurement conditions (temperature, humidity, etc.). Therefore, the output value of the urine sugar sensor 28 will be changed by change of toilet indoor ambient temperature, and measured value will be sharply changed not only by seasonal (atmospheric temperature) change but by change of the toilet room temperature of day and night. Since urine sugar sensor 28 output declines especially at the time of low temperature, accurate measurement becomes impossible, and it becomes the low thing of reliability.

[0193] When a temperature sensor 261 measures toilet indoor ambient temperature and becomes below constant temperature (for example, 5 degrees C) as correspondence of the technical problem mentioned above, a heating unit 236 is heated, and the proofreading liquid tank 24, the buffer-solution tank 26, and the measurement unit 11 interior are pulled up to an optimal temperature (for example, 10 degrees C). Since the heating unit 236 is arranged under the measurement unit 11, it can leak and heat the interior by the free convection. Moreover, what is necessary is for a measurement unit to be comparatively large, to circulate compulsorily by the fan etc., when an aperture is in internal temperature distribution, and just to use the warm air fan who has heating and circulation in this case.

[0194] Thus, although anti-freeze, such as a tank, is planned by preparing a heating unit, the controller 36 which is a control section is equipped with the freeze detection function which detects the freeze of the proofreading liquid tank 24 and the buffer-solution tank 26 the sake [when an emergency freeze occurs].

[0195] As one concrete example, when the detection value of temperature sensors 237 and 251 is less than constant value (for example, 1 degree C), a tank freeze "***" is memorized, and it displays on a display 39. As the other freeze judging methods, proofreading liquid and the buffer solution in a tank may be heated, and the method of detecting the freeze existence of liquid based on the temperature gradient may be used.

[0196] Moreover, it may detect that the proofreading liquid tank 24 and the buffer-solution tank 26 are sky condition, and you may cover a mask so that the detection value of a temperature sensor may not judge with a freeze below by constant value in this case.

[0197] A freeze can also be prevented by connecting the bimetal switch of an automatic reset (not shown) form with a heating unit 236 in series instead of temperature sensors 237 and 251 also besides having explained. A tubing heater, an infrared heater, a planar heating element, the ribbon heater of a heating unit 236, etc. are good anything.

[0198] Moreover, the history of a freeze is memorized by non-volatile memory 367, and if storage is canceled by performing predetermined operation and predetermined liquid exchange, using it for measurement can prevent the frozen proofreading liquid and the buffer solution certainly.

[0199] Furthermore, the example for making temperature of the liquid made to flow into the urine sugar sensor 28 an elevated temperature and regularity as correspondence of another technical problem is explained.

[0200] The temperature of the urine sugar sensor 28 by which an output is stabilized most highly is about about 37 degrees C. therefore, the degree of inflow solution temperature to the urine sugar sensor 28 and an urine sugar sensor -- 28 the very thing, further, if the temperature inside [whole] measurement unit 11 is controlled by this temperature, precision will be most improved by measurement

[0201] However, having mentioned above is an ideal and the equipment with which are satisfied of all will become a large sum object. Furthermore, a life becomes short although urine sugar sensor 28 property in this temperature is good (not shown).

[0202] Then, in this example, it has proposed lowering comparatively the degree of inflow solution temperature to the urine sugar sensor 28 in consideration of a property and a life, and controlling it to temperature (25 degrees C of abbreviation [Specifically]).

[0203] However, for some users, a user's needs differ by each people, and consider a sensor life by priority (a sensor output, i.e., the accuracy of measurement, is comparatively inferior in this case), and give priority to and consider a sensor output, i.e., the accuracy of measurement, for some another users (a sensor life becomes comparatively short in this case).

[0204] Then, in order to respond to such various users' needs, it is good for a controller 36 and a control unit 38 to establish a solution temperature setting means. For example, the degree of solution temperature will be set as the long temperature (25 degrees C of for example, abbreviation) of a sensor life by the degree of solution temperature being set as the highest temperature (37 degrees C of for example, abbreviation) of the accuracy of measurement, and making a setup into "low precision" by making the setting section in a control unit 38 (not shown) into "high degree of accuracy."

[0205] As mentioned above, what is necessary is to have only such a heating unit, when maintaining the degree of solution temperature more than constant value, although heating of liquid was explained. However, it is good to prepare similarly the cooling section of liquid which used the Peltier element etc. other than the heating unit to maintain solution temperature at the degree of low temperature from a general room temperature (especially summer).

[0206] Here, the mold of uroscopy equipment and various-germs propagation prevention are explained.

[0207] The matter used as the nutrition of mold or various germs is contained in urine. As already stated, uroscopy equipment begins the urine test section and has urine conveyance paths, such as piping along which urine passes, and the mold and various germs which drift in air to this will adhere and breed. To say nothing of an insanitary thing, further, by propagation of various germs and mold, an entrance, the interior, etc. of a tube which are a urinary passage path will be got blocked, and these will cause trouble to urine test and measurement, when not used for a long period of time.

[0208] Then, propagation of mold or various germs can be suppressed for a urinary conveyance path by establishing a means to dip the liquid which has sterilization and the mildewproofing effect for a urinary conveyance path.

[0209] In this example, minute amount (for example, less than 0.05 - 0.1%) mixing of the component (for example, sodium azide) which has sterilization and the mildewproofing effect in the buffer solution is carried out.

[0210] As timing which makes the buffer solution mentioned above for the urinary conveyance path dip, timing 1 (1 time/(day)), timing 2 (1 time/(week)), timing 3 (every 1 time / measurement), etc. can be considered. The timing 1 that the stage (for example, rainy season term) when such timing adheres at and mold and various germs tend to breed is comparatively short, and the stage (for example, winter) when neither mold nor various germs can adhere and breed easily conversely can also be changed to the condition called comparatively long timing 2.

[0211] Furthermore, when there are comparatively many measurement counts on the 1st, since it is washed well, mold and various germs adhere and a urinary conveyance path cannot breed easily. Conversely, when there are comparatively few measurement counts on the 1st, or when not being measured what day, mold and various germs tend to adhere and breed. Therefore, it is also possible to change the timing made to dip in consideration of the measurement count on the 1st.

[0212] Finally, this example explains the information means to the user of an urine sugar sensor 28 exchange stage, and timing. In addition, about proofreading liquid and the buffer solution, since it has mentioned above, detailed explanation here is omitted.

[0213] Since an enzyme film is protein as the property described, while the urine sugar sensor 28 has a limit in a usage count, a time life exists.

[0214] First, about a usage count, although it mentioned above carrying out "sensor life count-up" (Step S789) to the flow chart of drawing 37, the data of a sensor usage count are updated here. Of course, as long as this step is among measurement distance, you may insert it in which place.

[0215] Next, although it is a time life, this makes the resistance welding time to a controller 36 memorize to EEPROM every (every [for example,] hour) fixed time of a certain using the time timer in CPU362.

[0216] In this example, M level and L level are prepared about the life preliminary announcement of a sensor as well as proofreading liquid and the buffer solution, and the information means to a user is considered as blink of the urine sugar sensor exchange Light Emitting Diode 394 of a control unit 38, and lighting.

[0217] In addition, an information means can connect meanses (for example, optical communication etc.) to communicate to the toilet exterior with drawing 16 and the terminal 114 for communication of drawing 19 not only like the means mentioned above but like proofreading liquid and the buffer solution. By doing so, it becomes possible to receive the use history (life preliminary announcement to include) of a sensor with communicative receiving meanses (for example, portable remote control etc.), even if a user does not go on that occasion.

[0218] As mentioned above, although the gestalt of operation of this invention has been explained, as for this invention, it is needless to say that it can carry out with the gestalt which becomes various within limits which are not limited to the gestalt of such operation at all, and do not deviate from the summary of this invention.

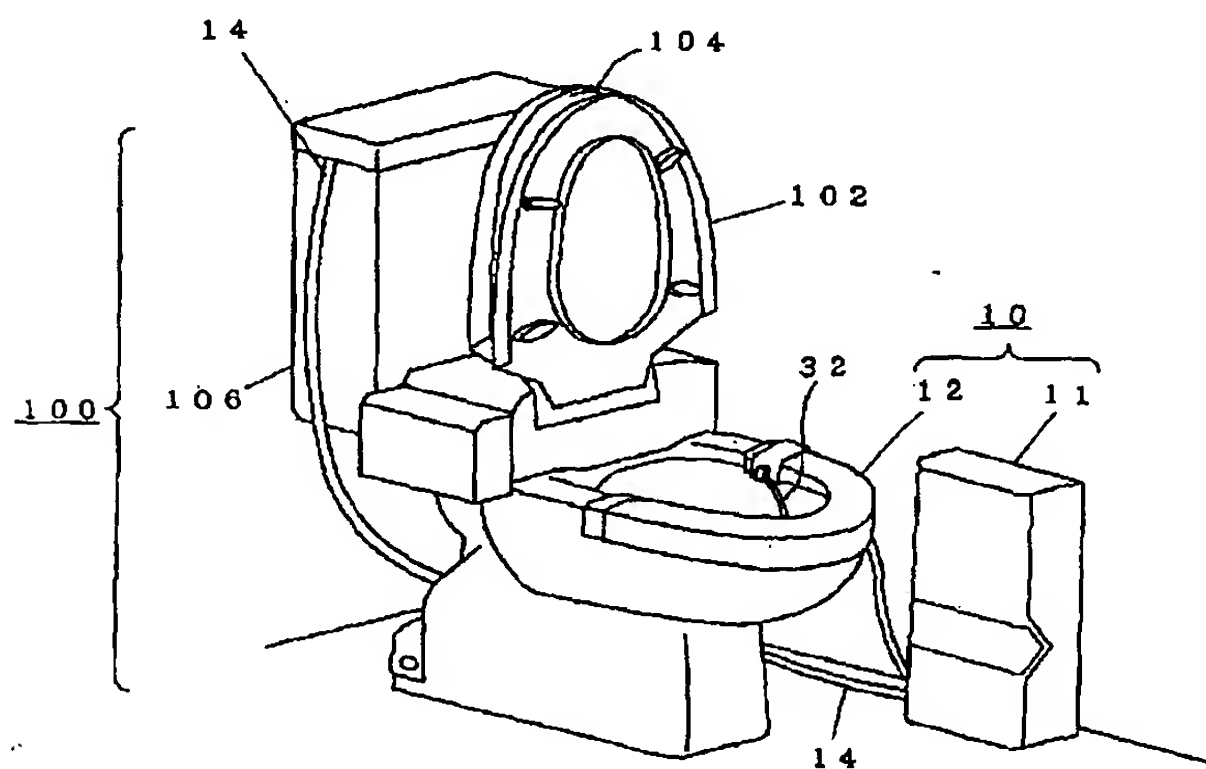
* NOTICES *

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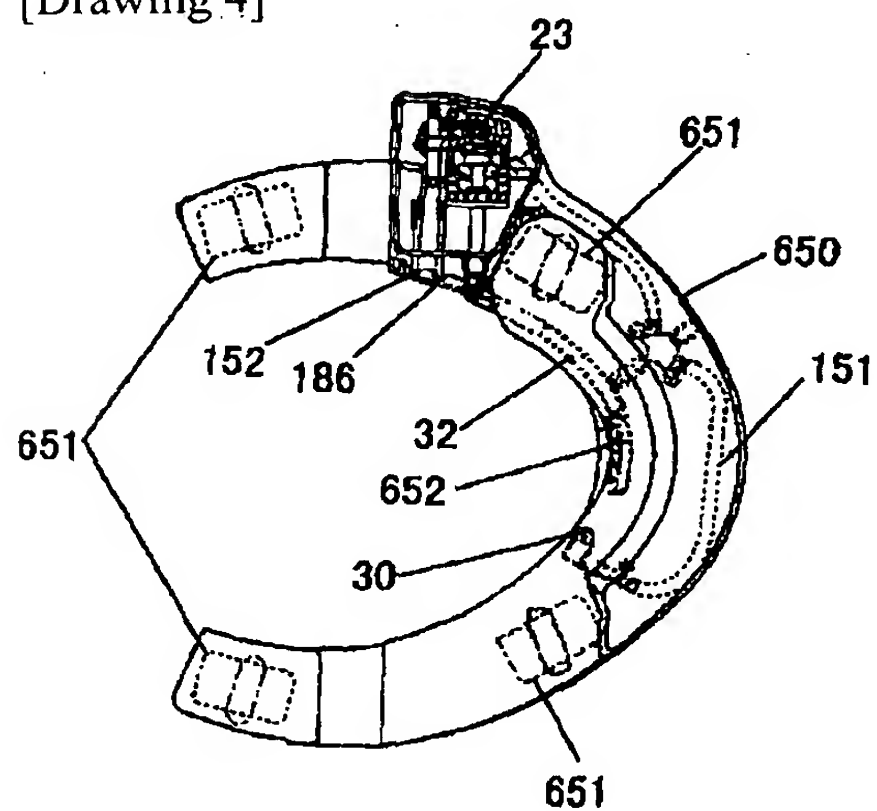
1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DRAWINGS

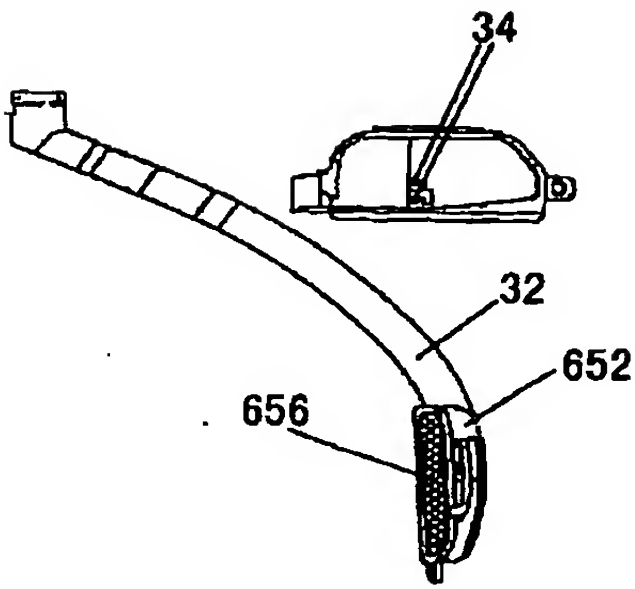
[Drawing 1]



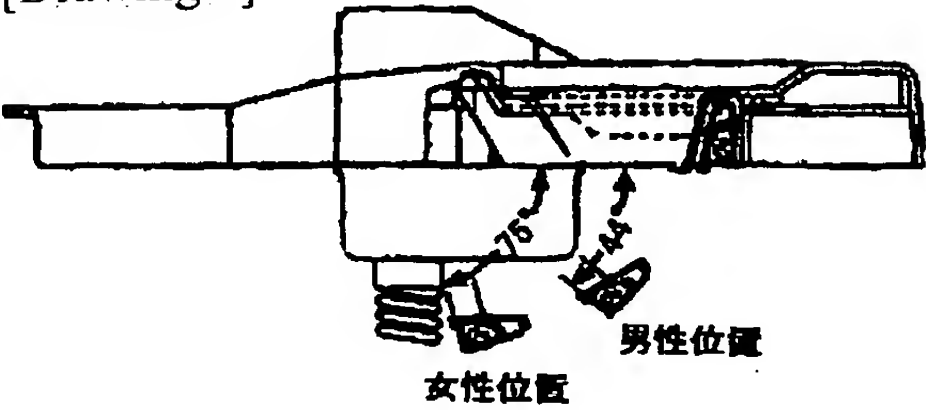
[Drawing 4]



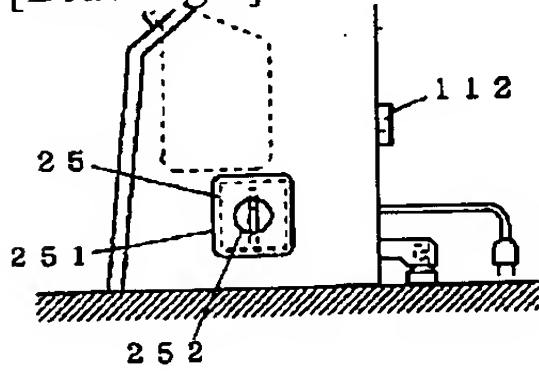
[Drawing 5]



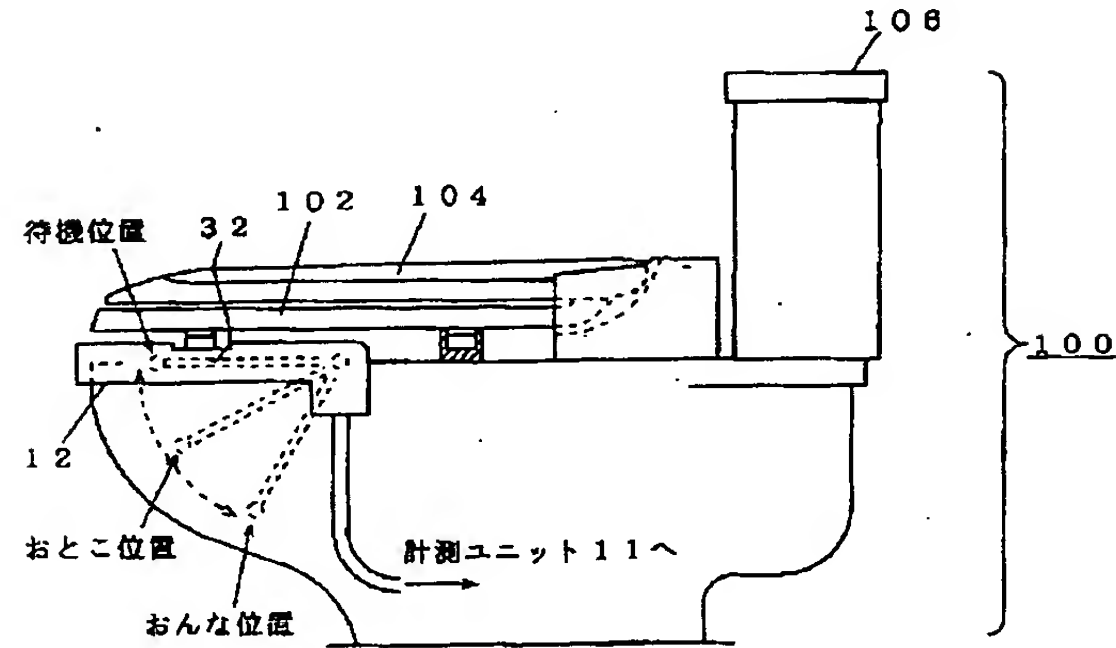
[Drawing 6]



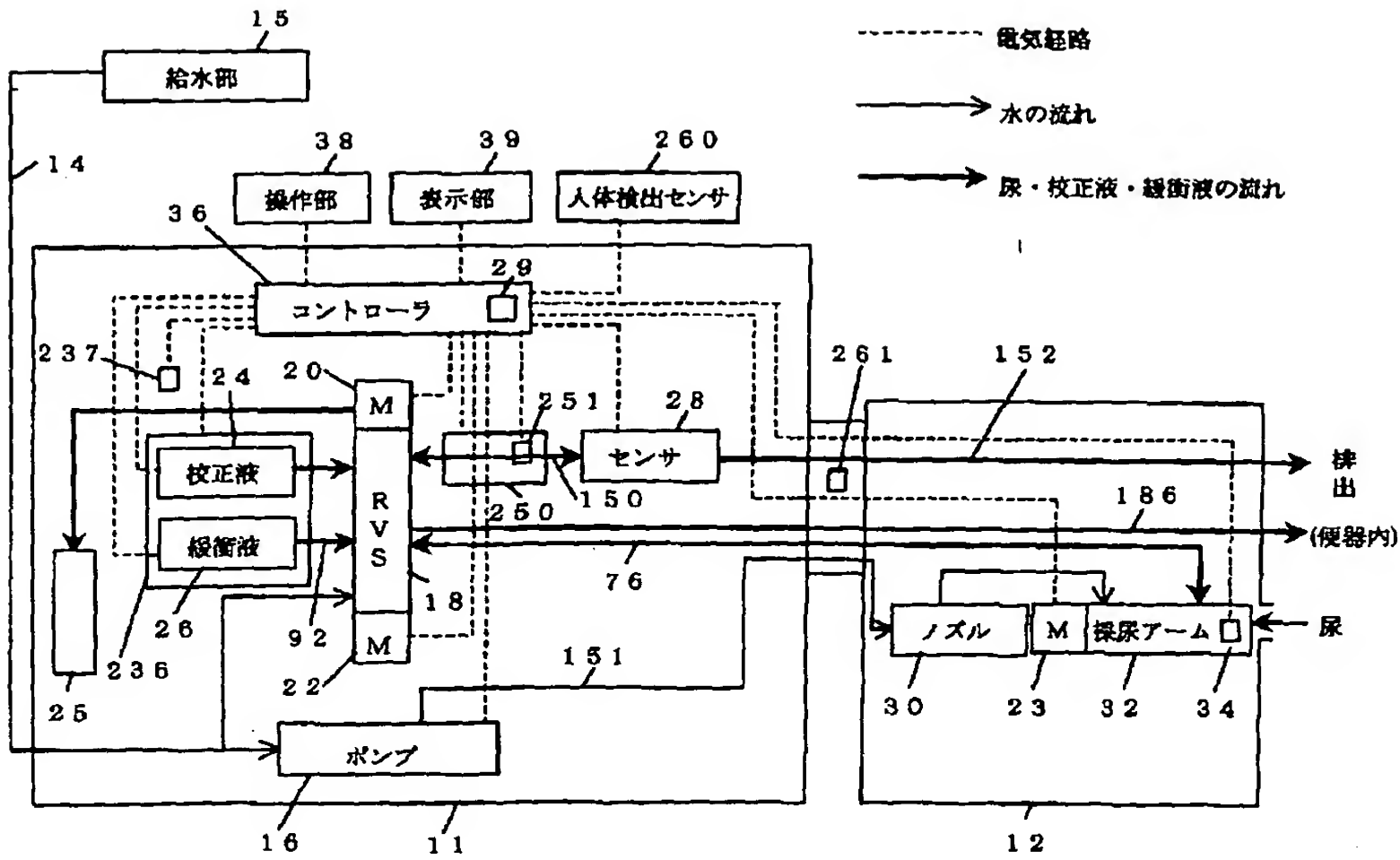
[Drawing 9]



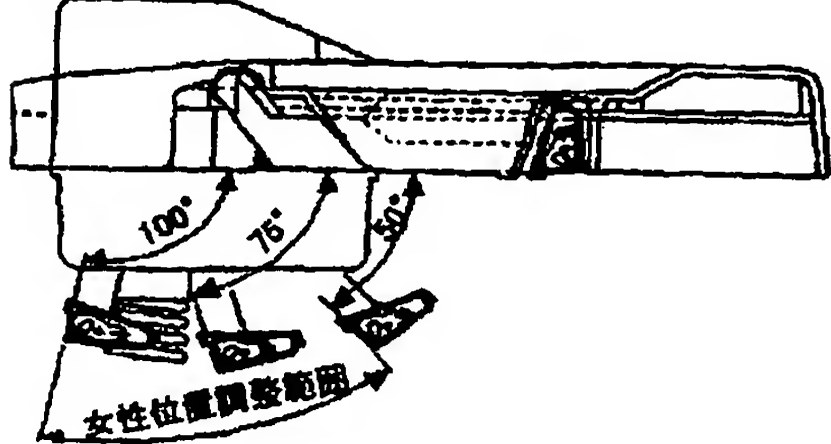
[Drawing 2]



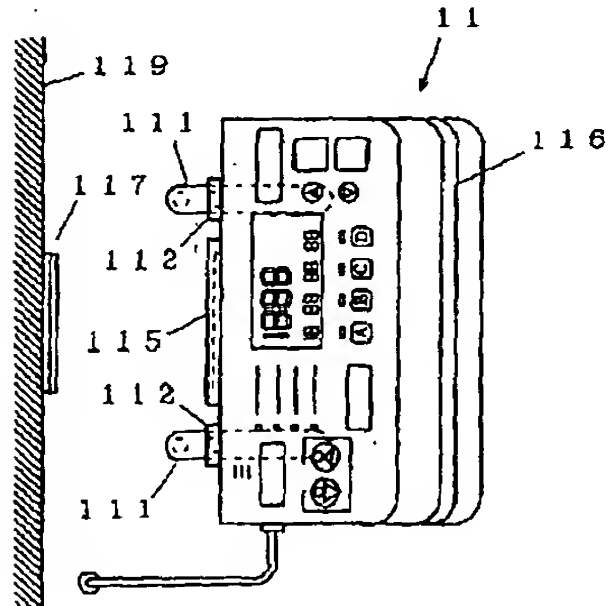
[Drawing 3]



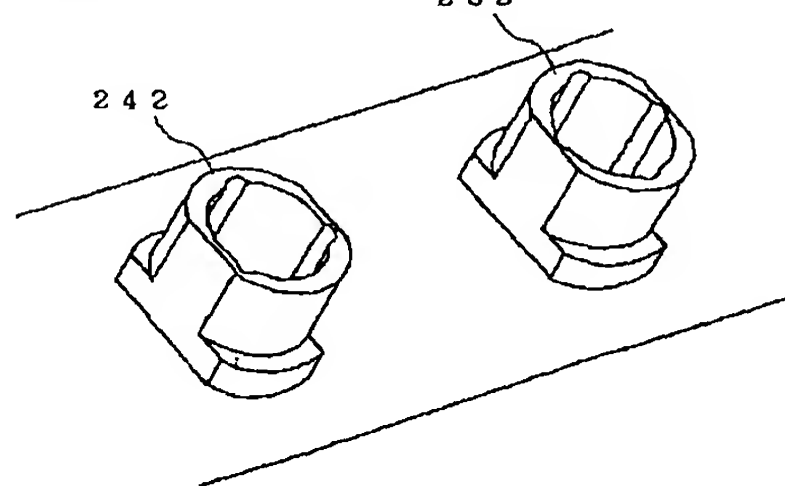
[Drawing 7]



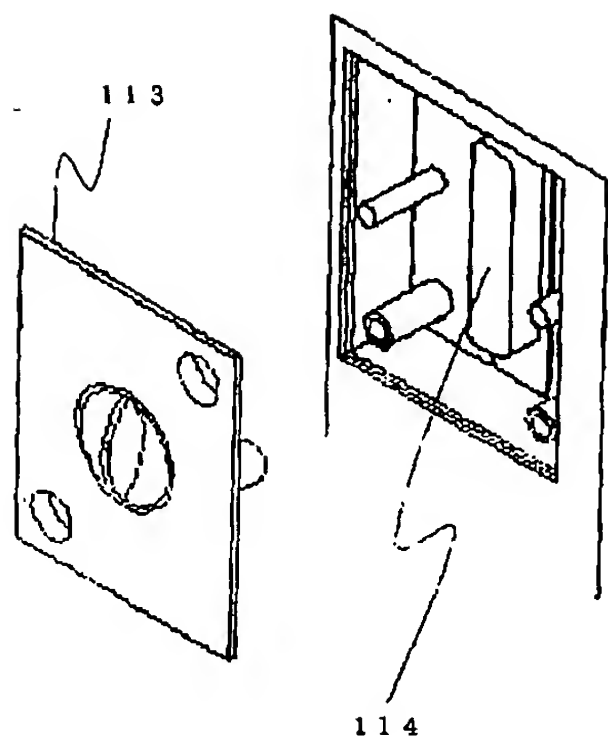
[Drawing 11]



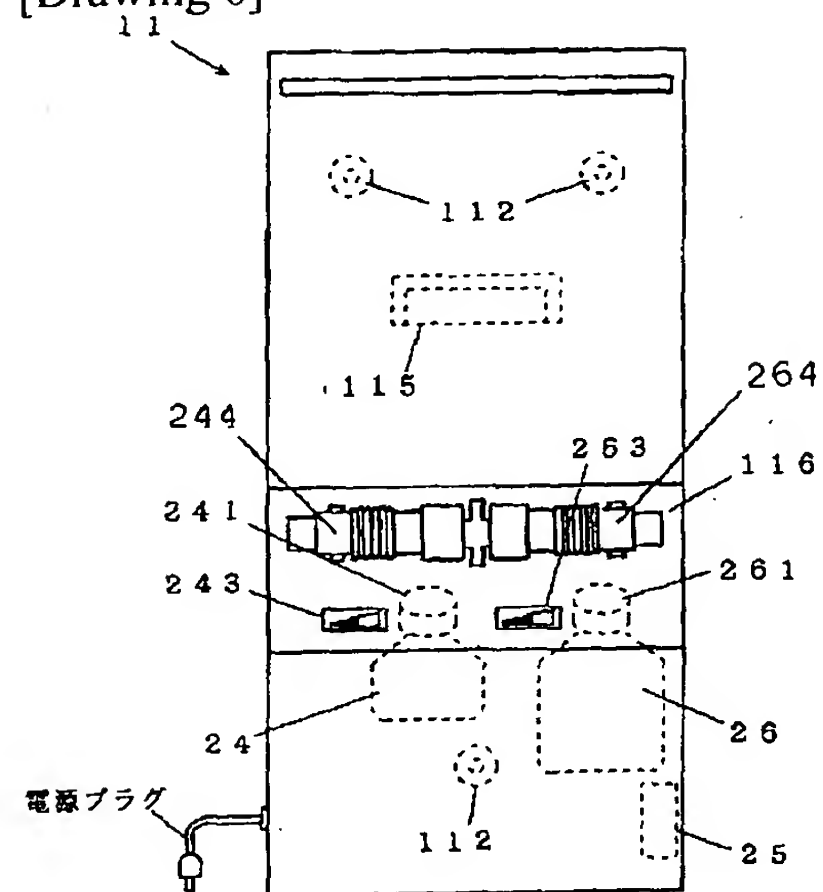
[Drawing 12]



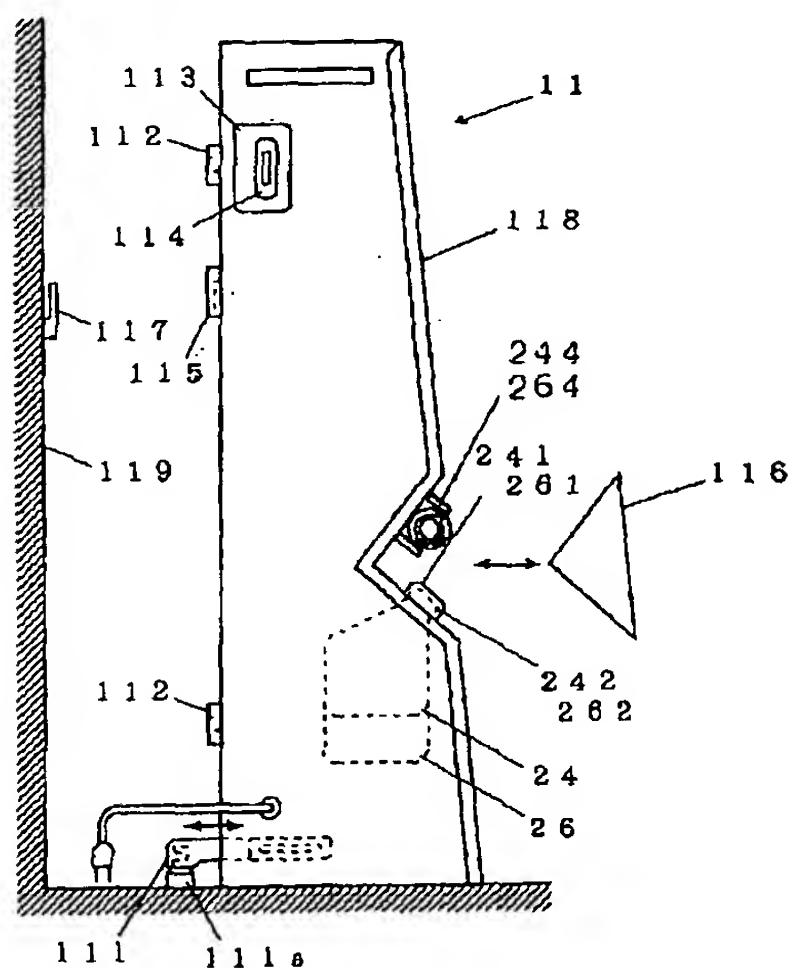
[Drawing 42]



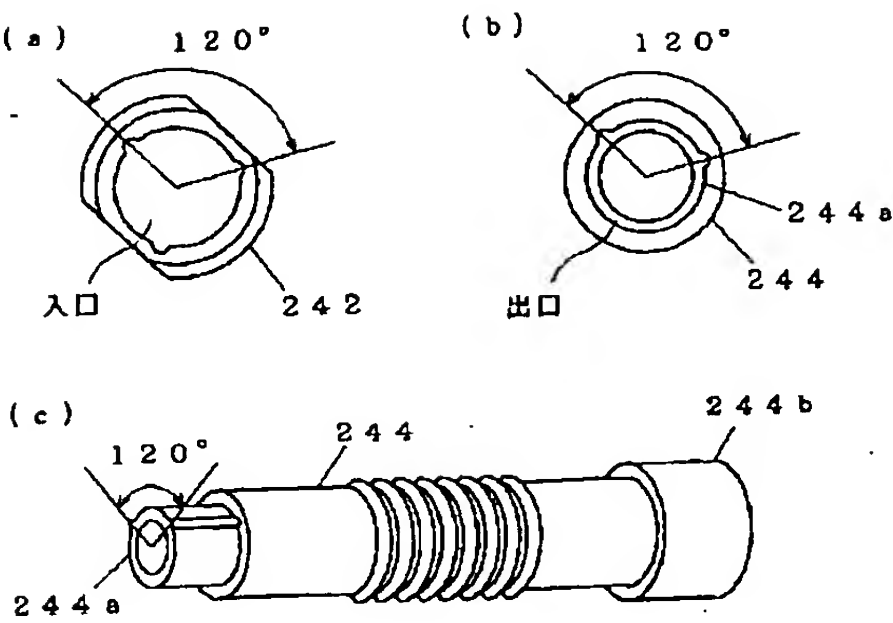
[Drawing 8]



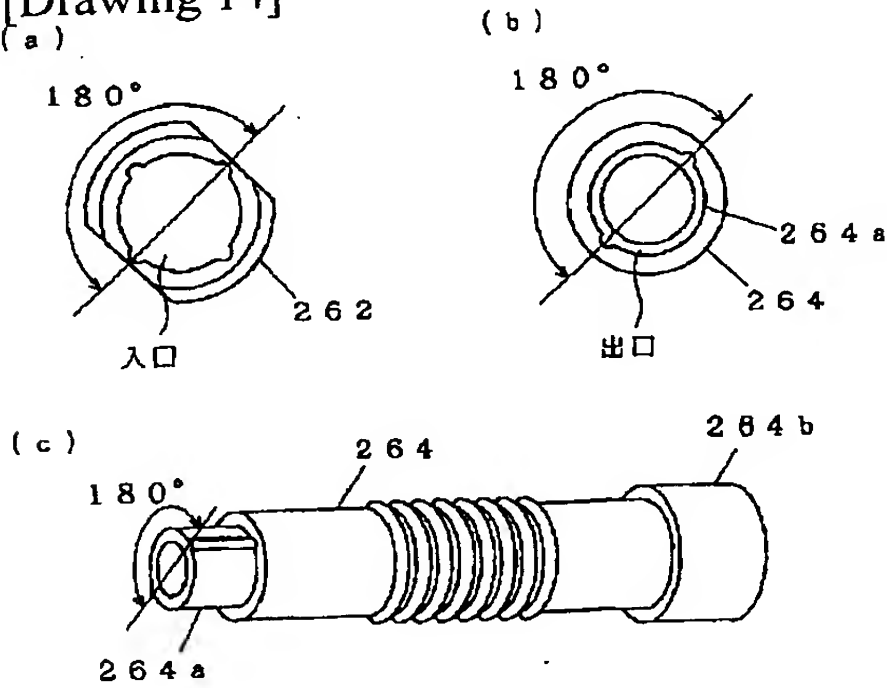
[Drawing 10]



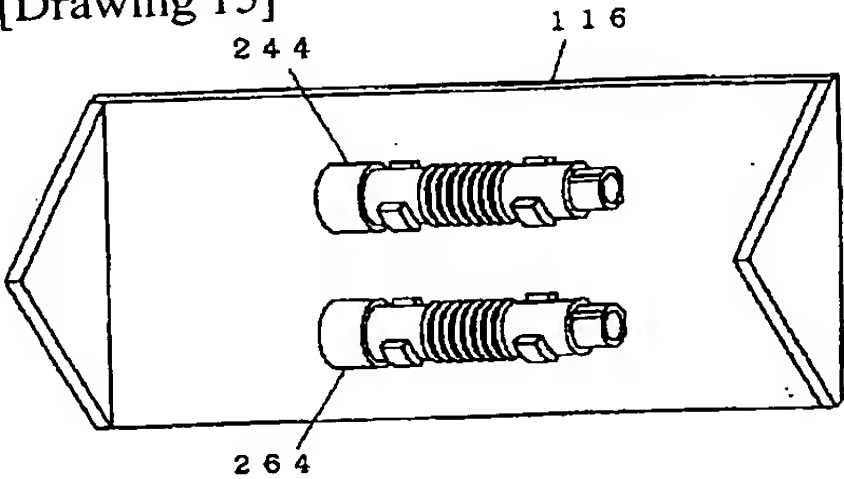
[Drawing 13]



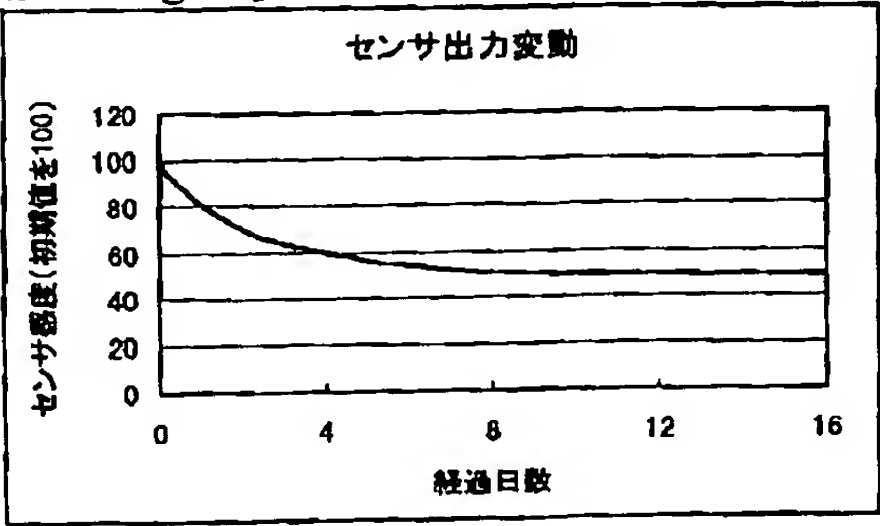
[Drawing 14]



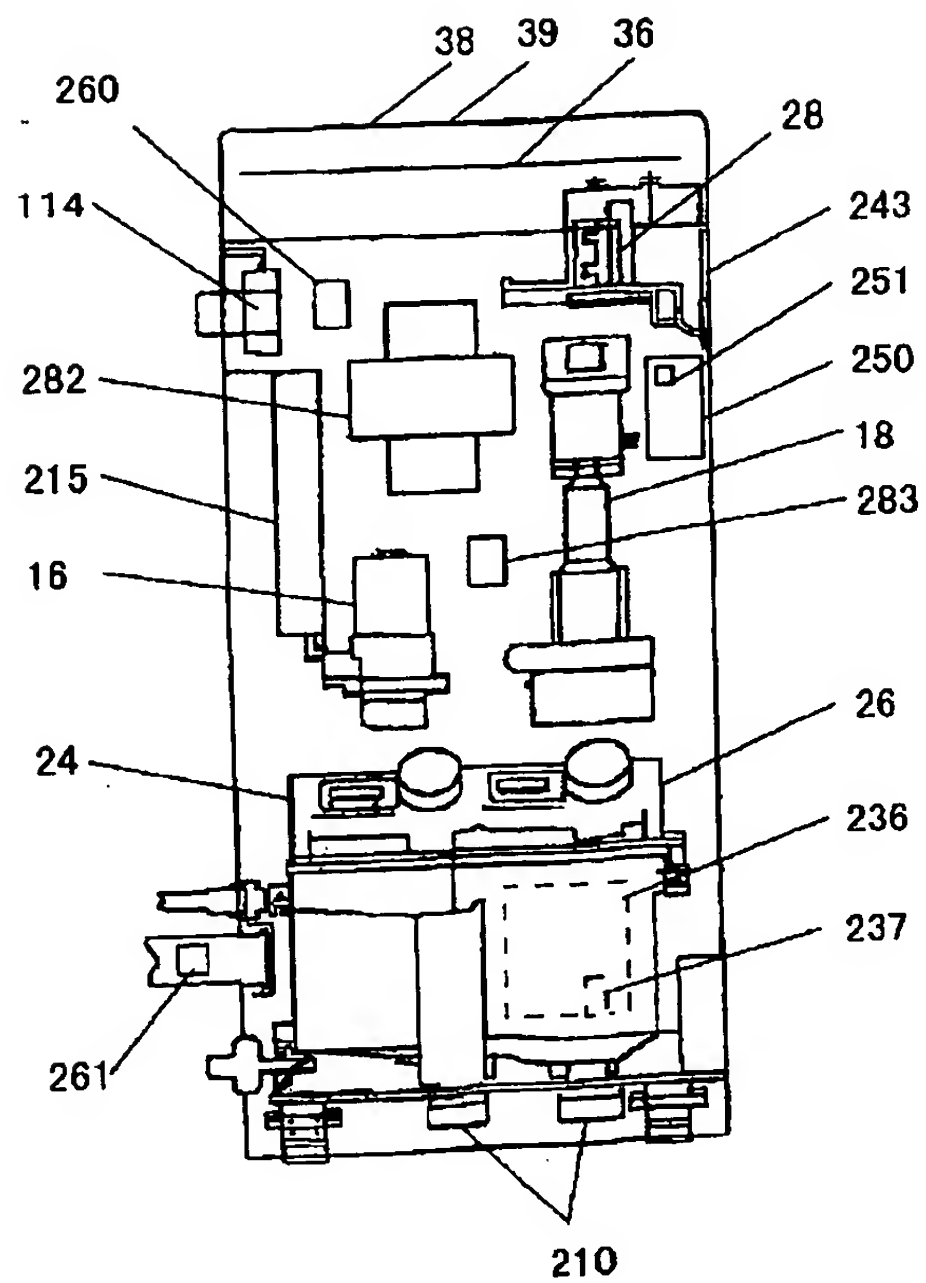
[Drawing 15]



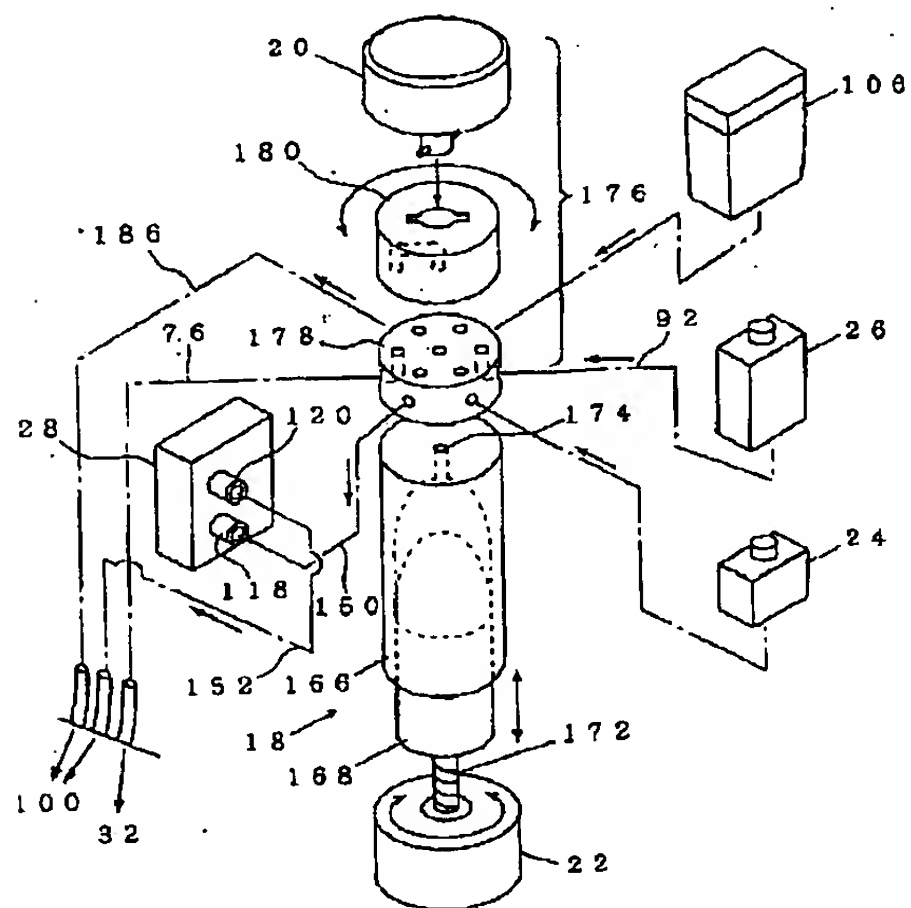
[Drawing 39]



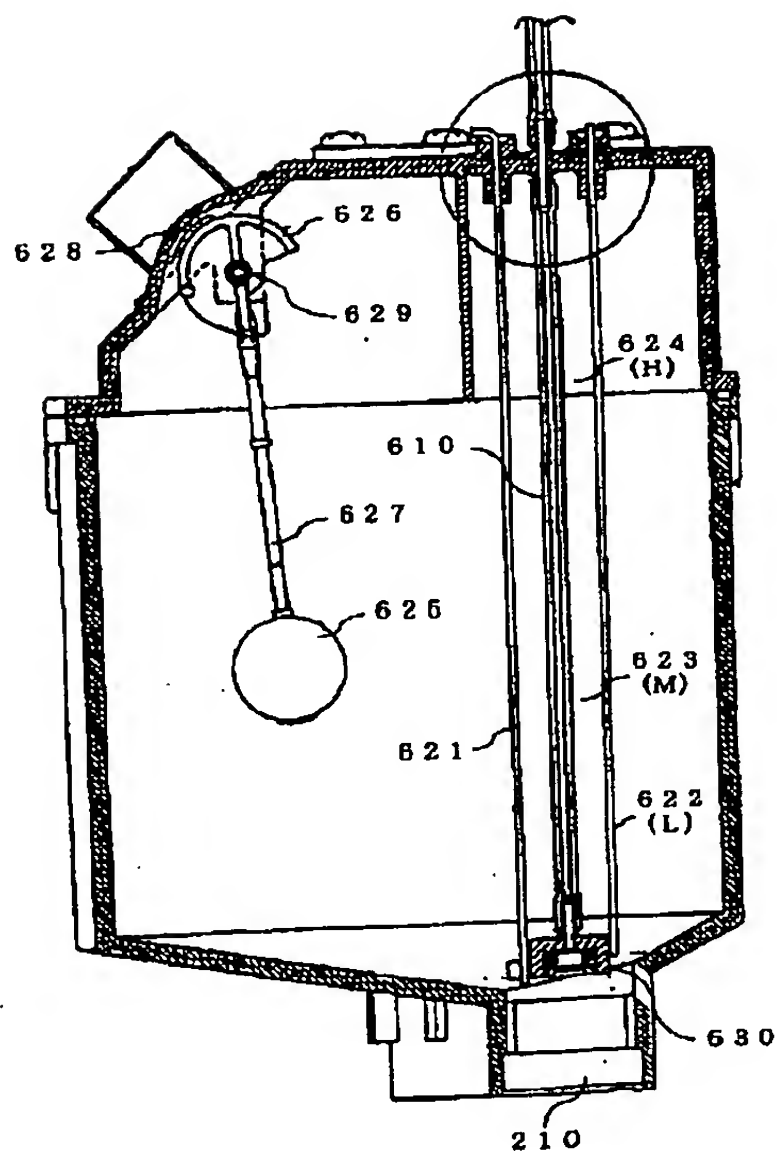
[Drawing 16]



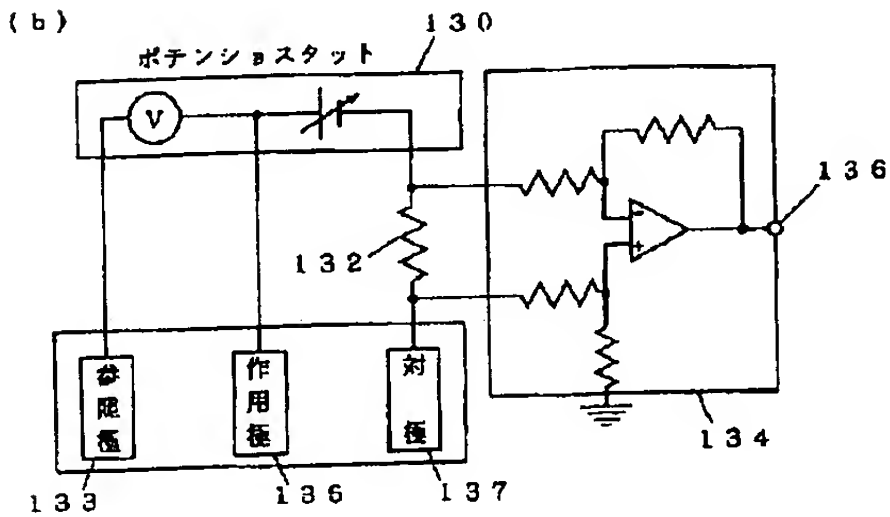
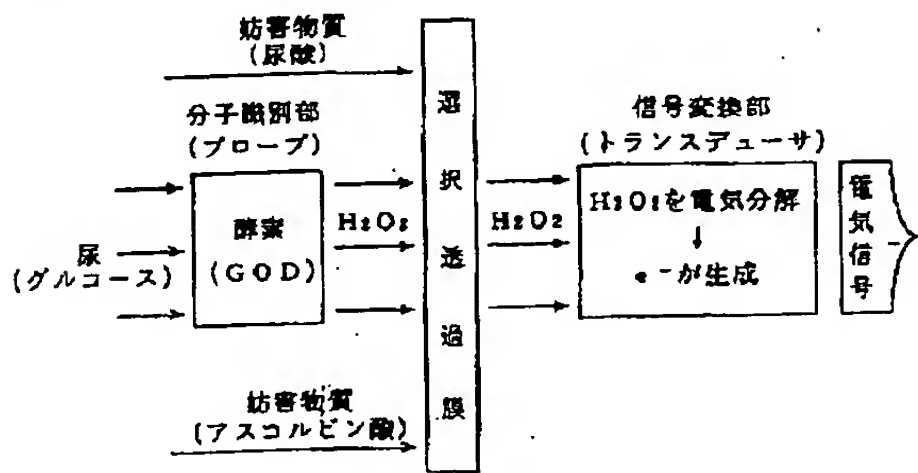
[Drawing 17]



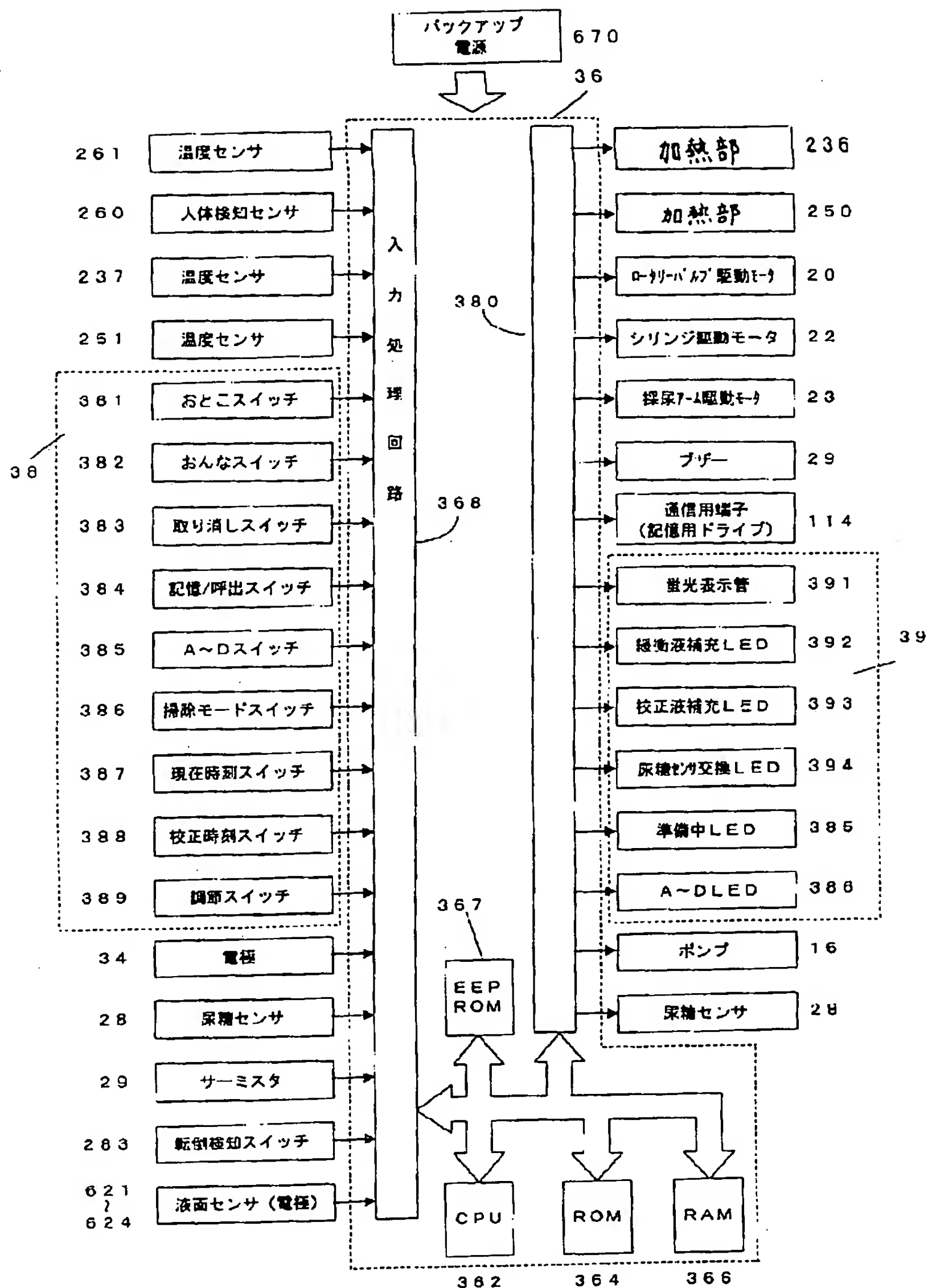
[Drawing 18]



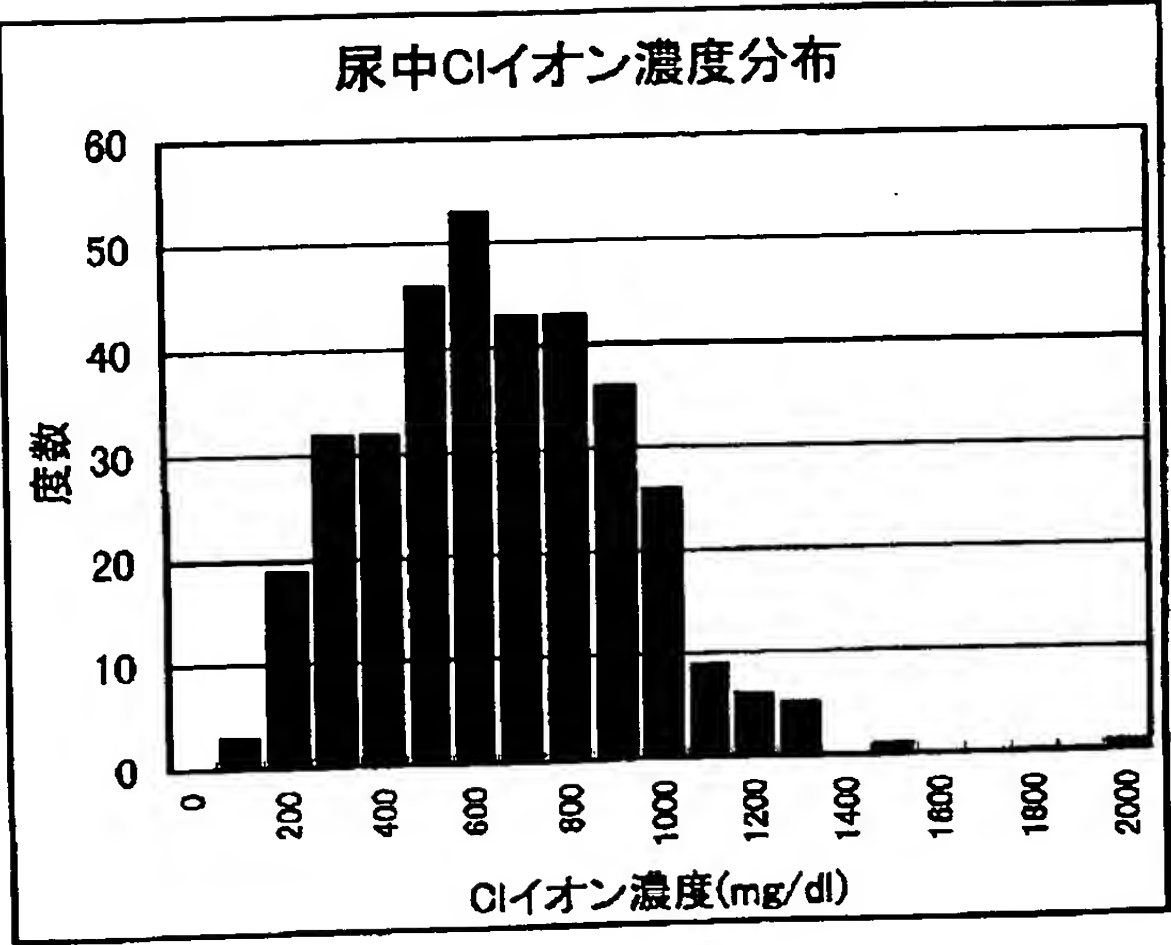
[Drawing 20]



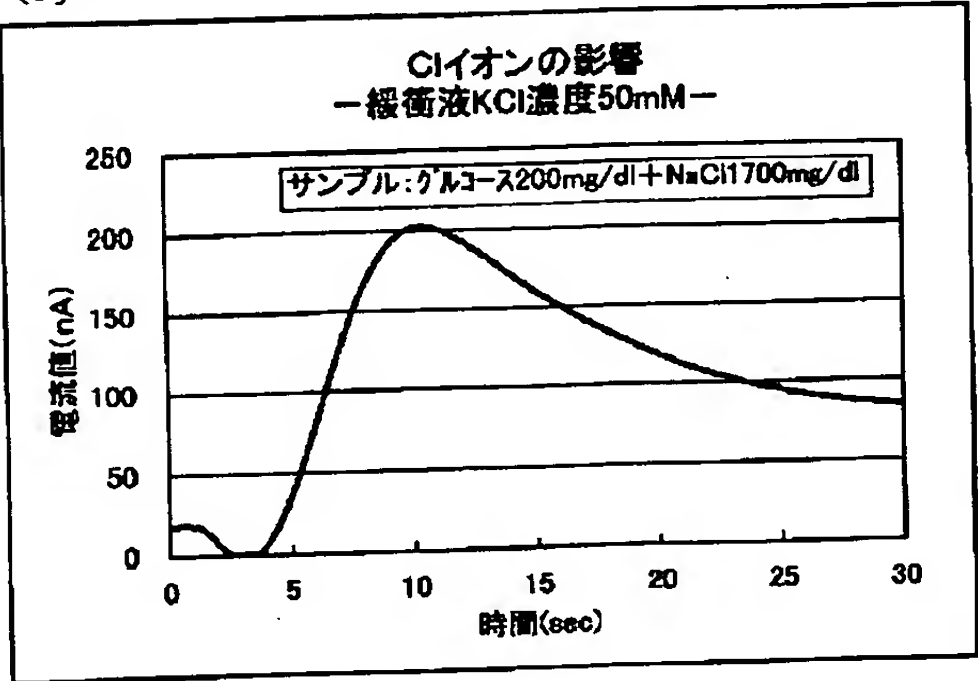
[Drawing 19]



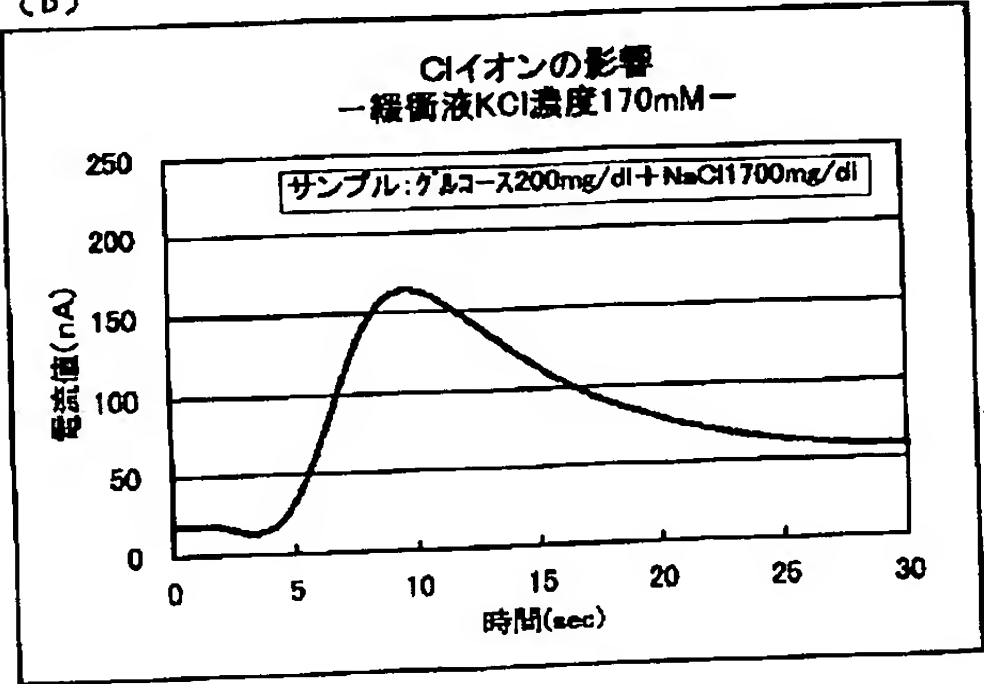
[Drawing 21]



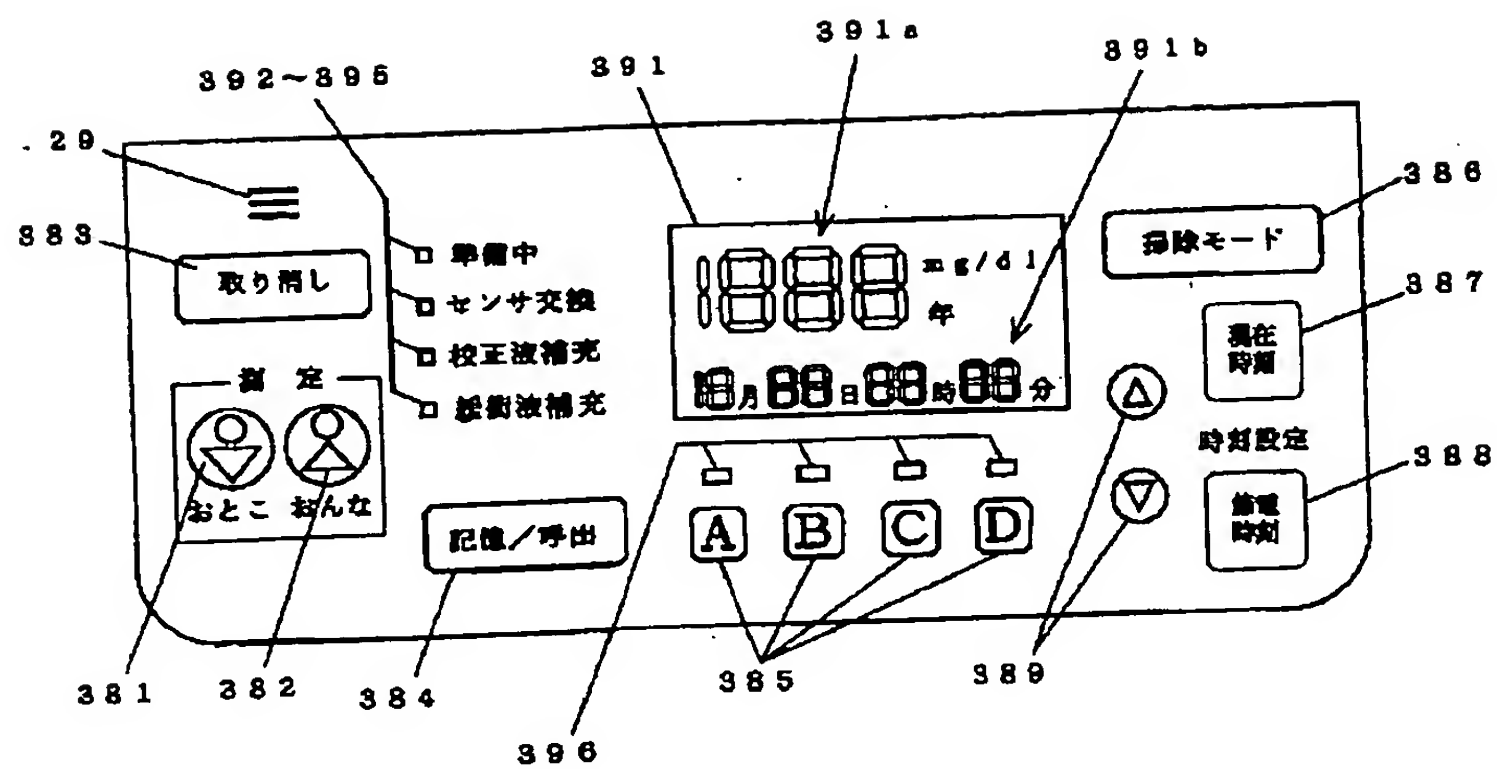
[Drawing 22]
(a)



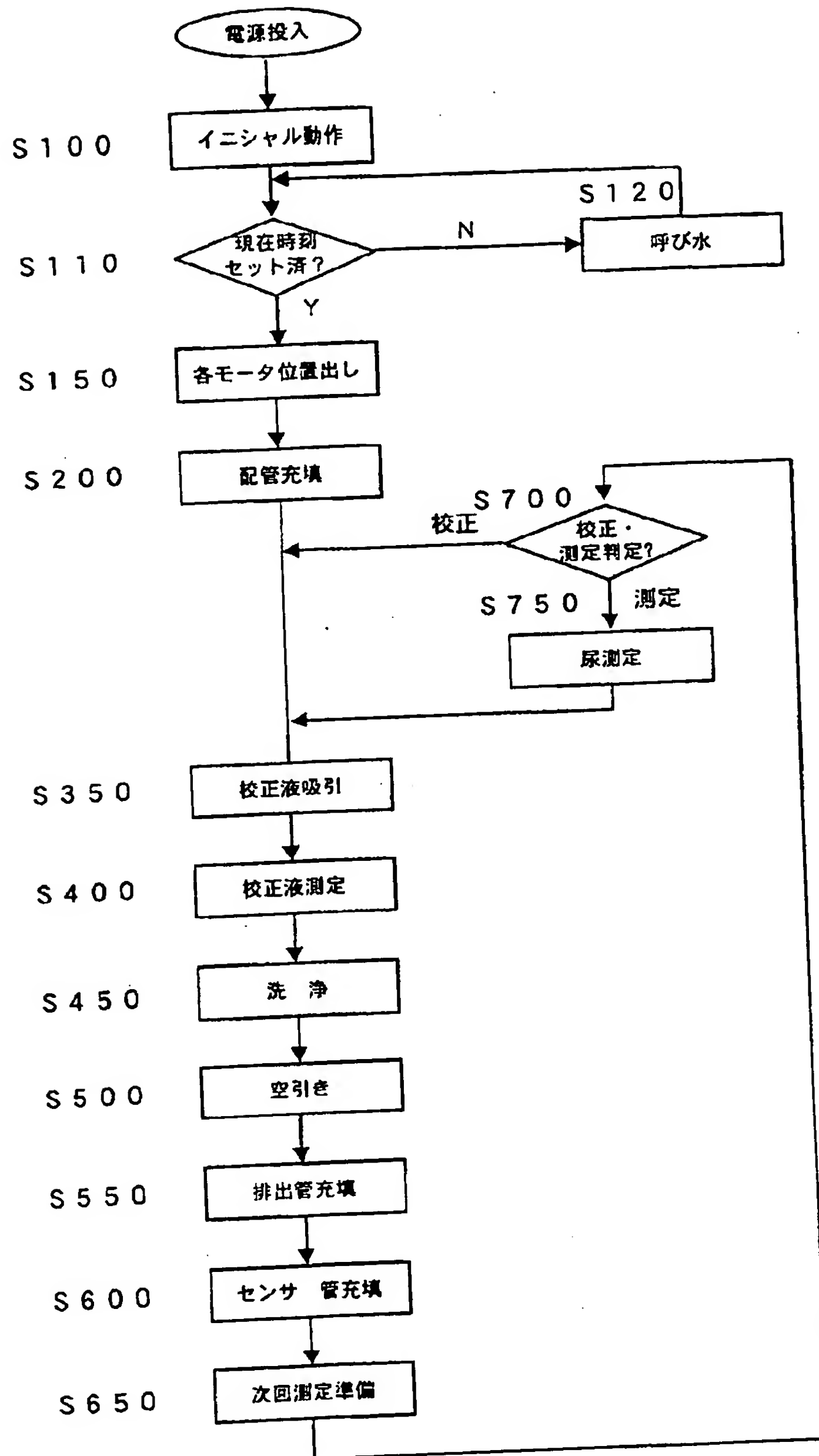
(b)



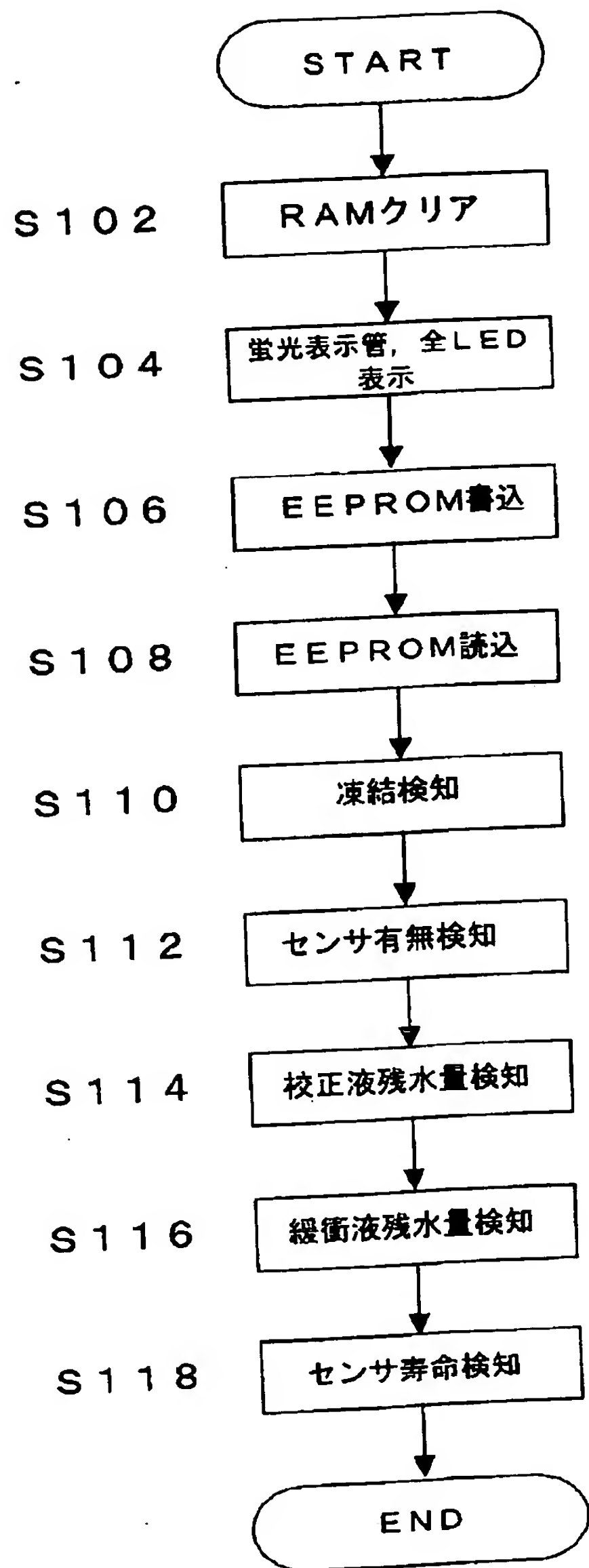
[Drawing 23]



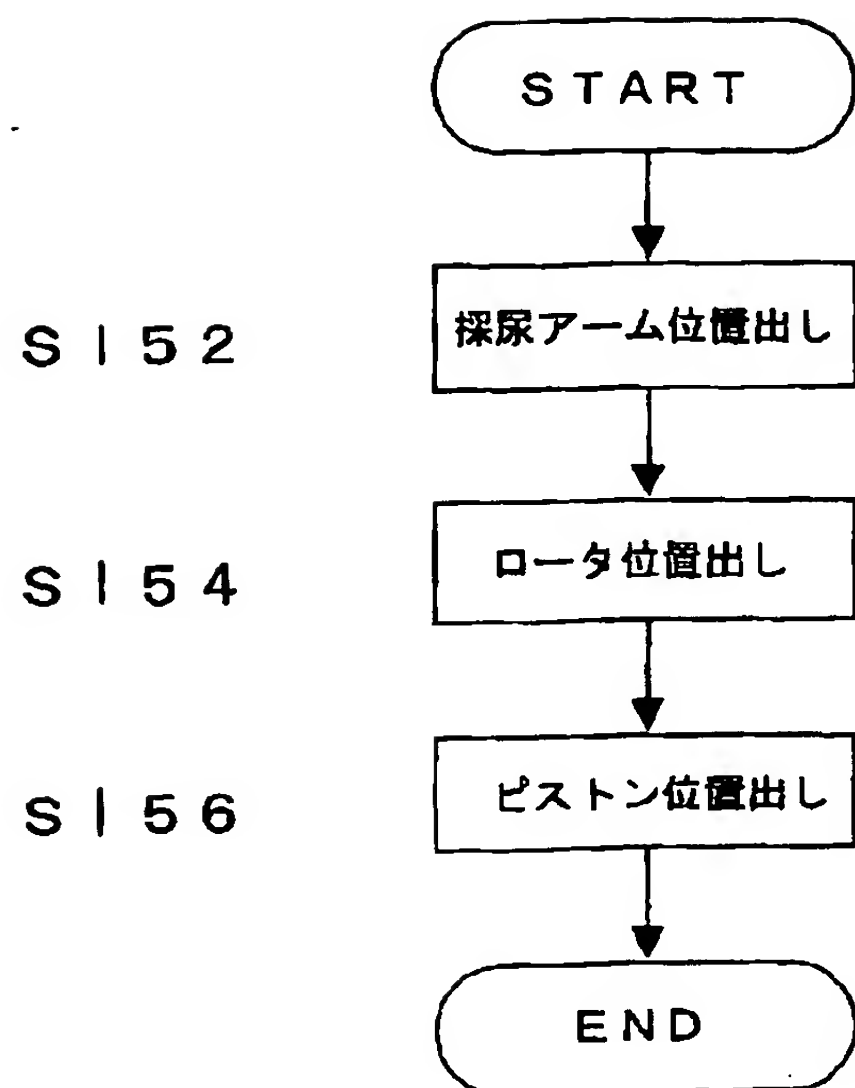
[Drawing 24]



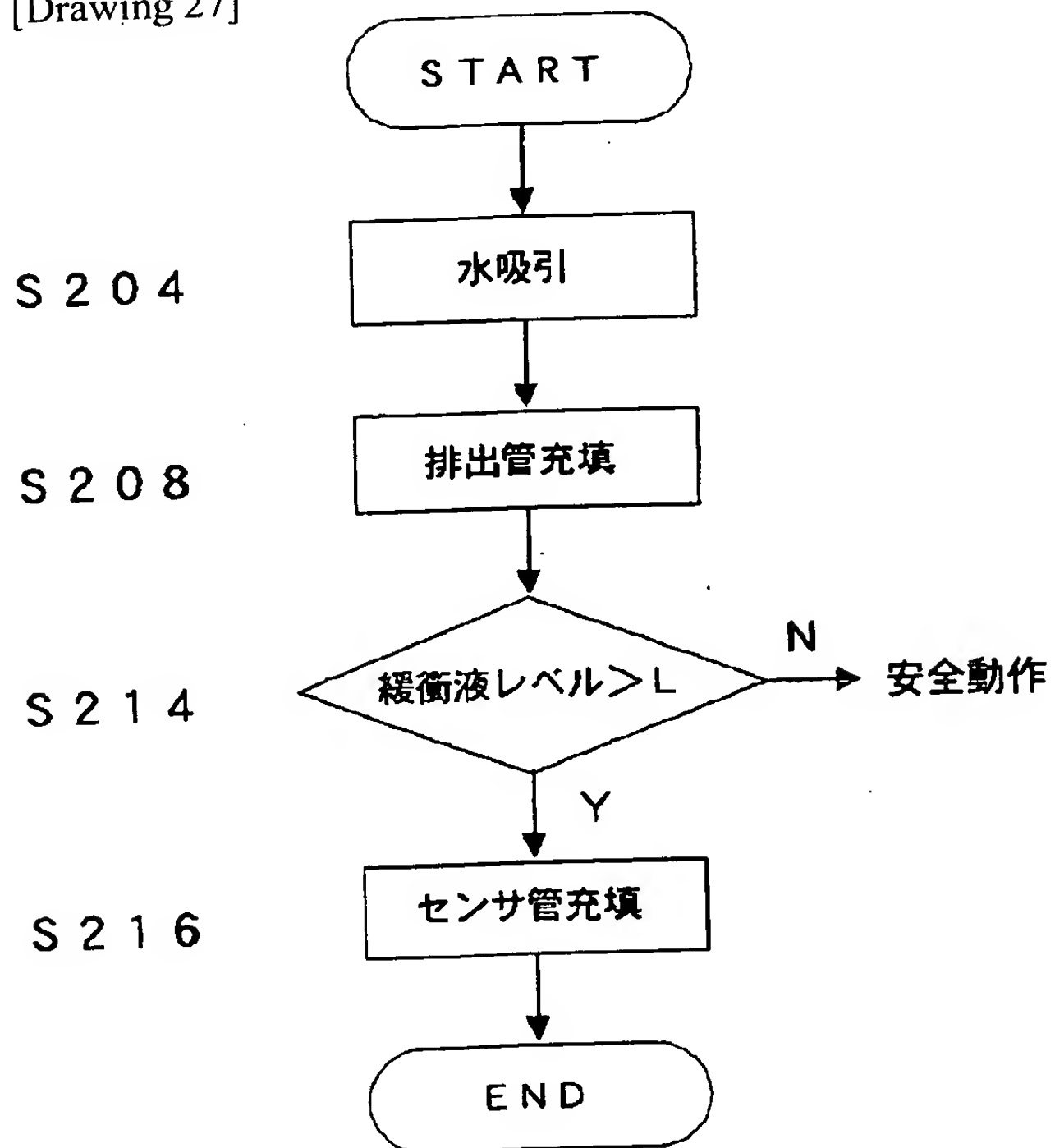
[Drawing 25]



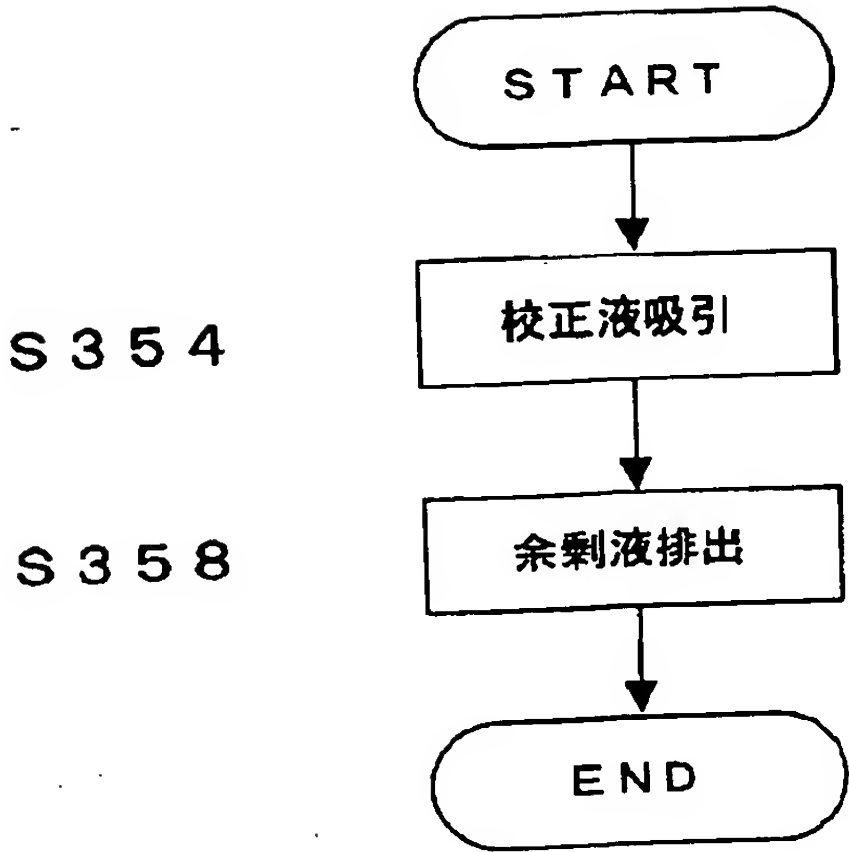
[Drawing 26]



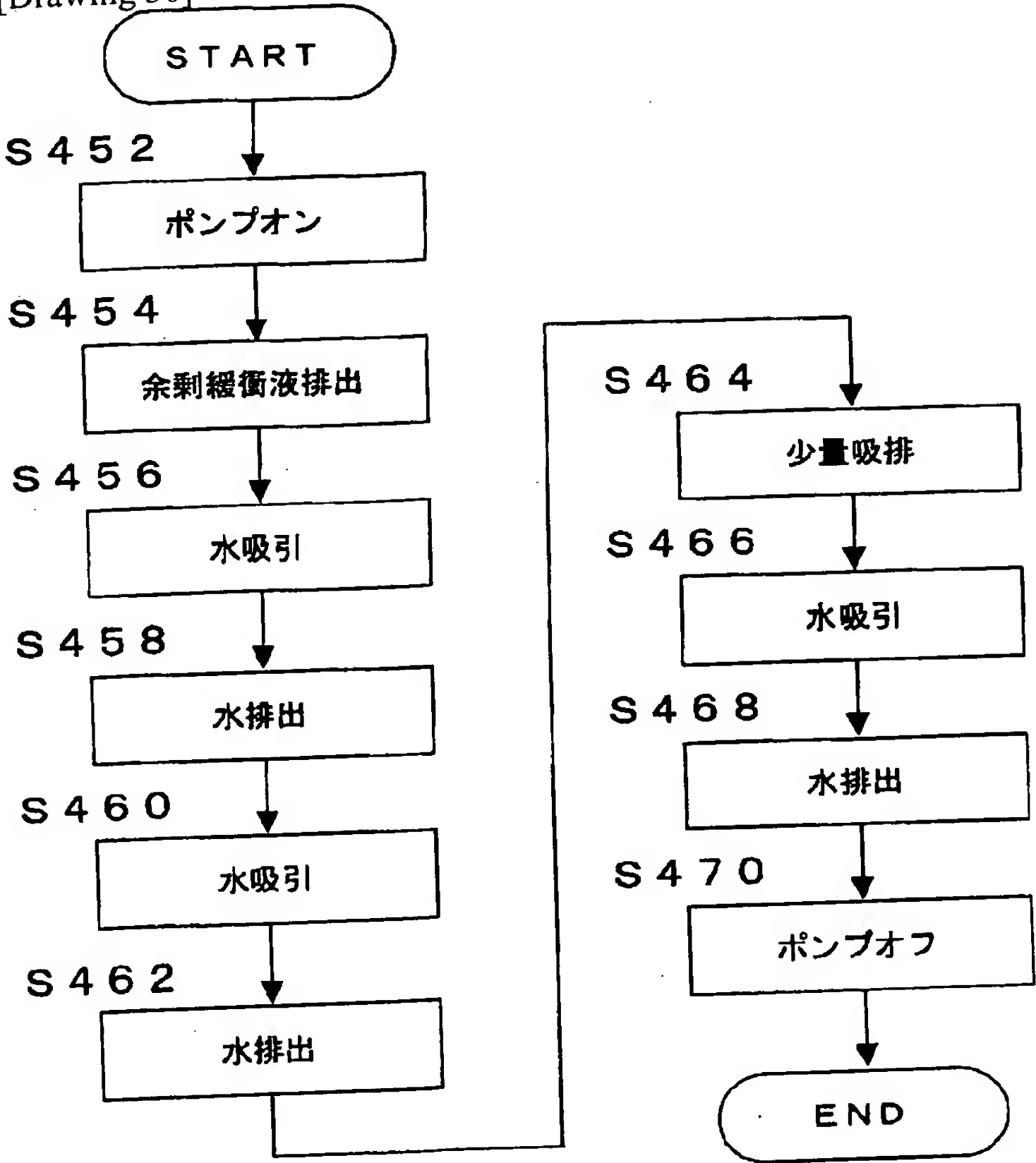
[Drawing 27]



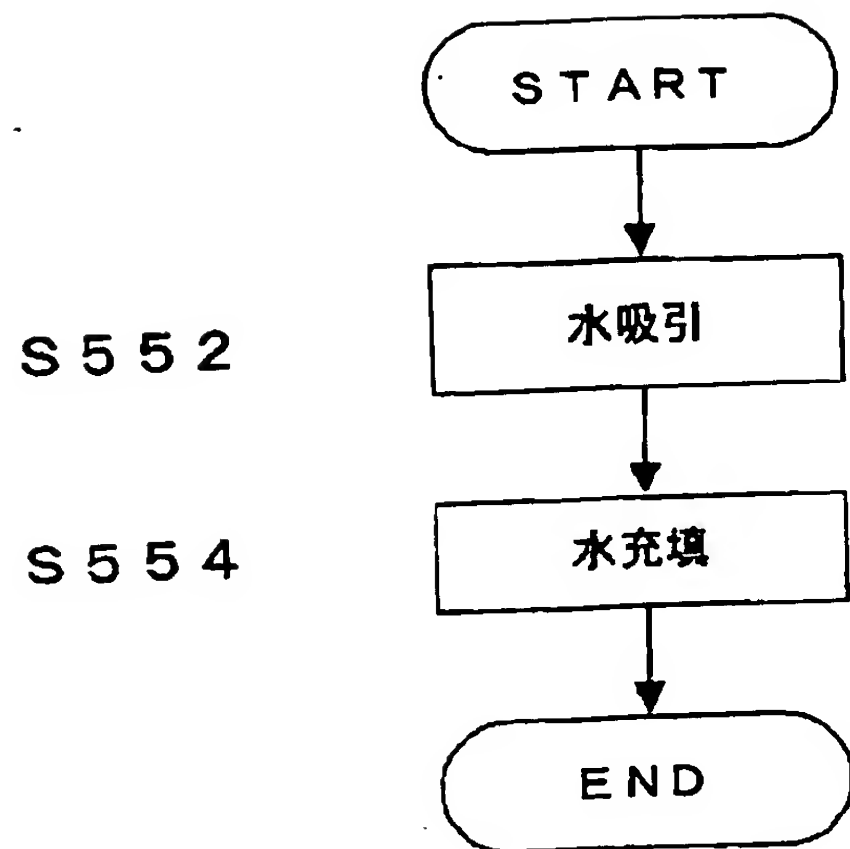
[Drawing 28]



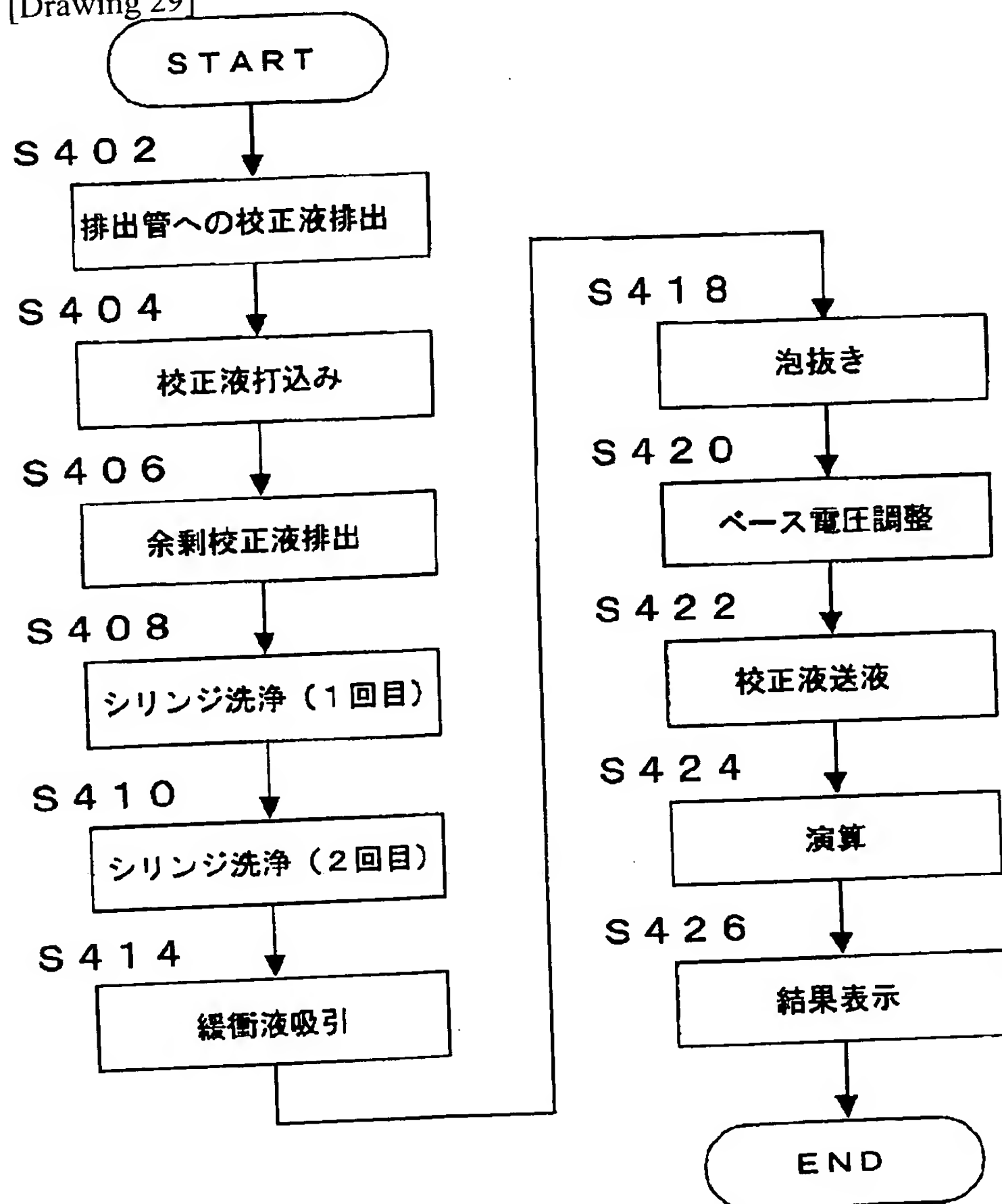
[Drawing 30]



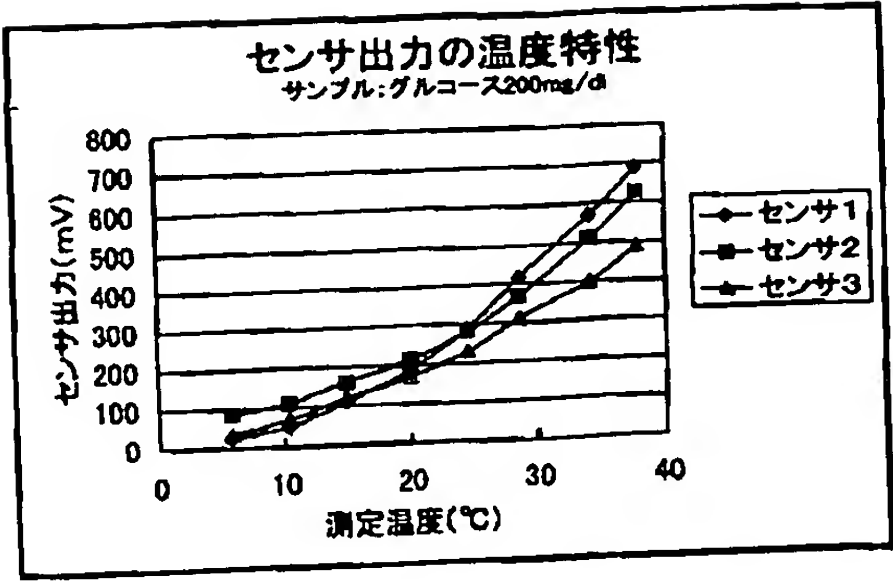
[Drawing 32]



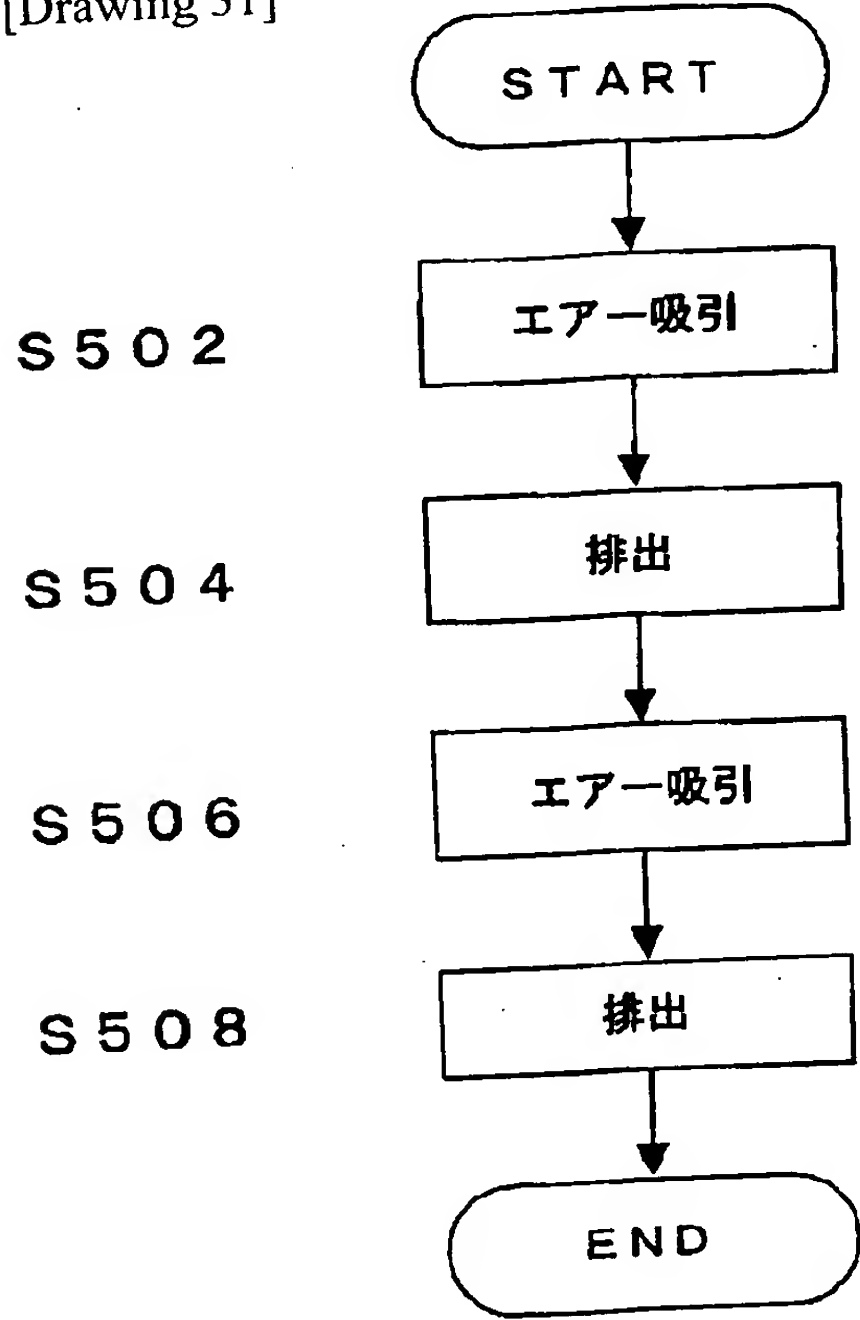
[Drawing 29]



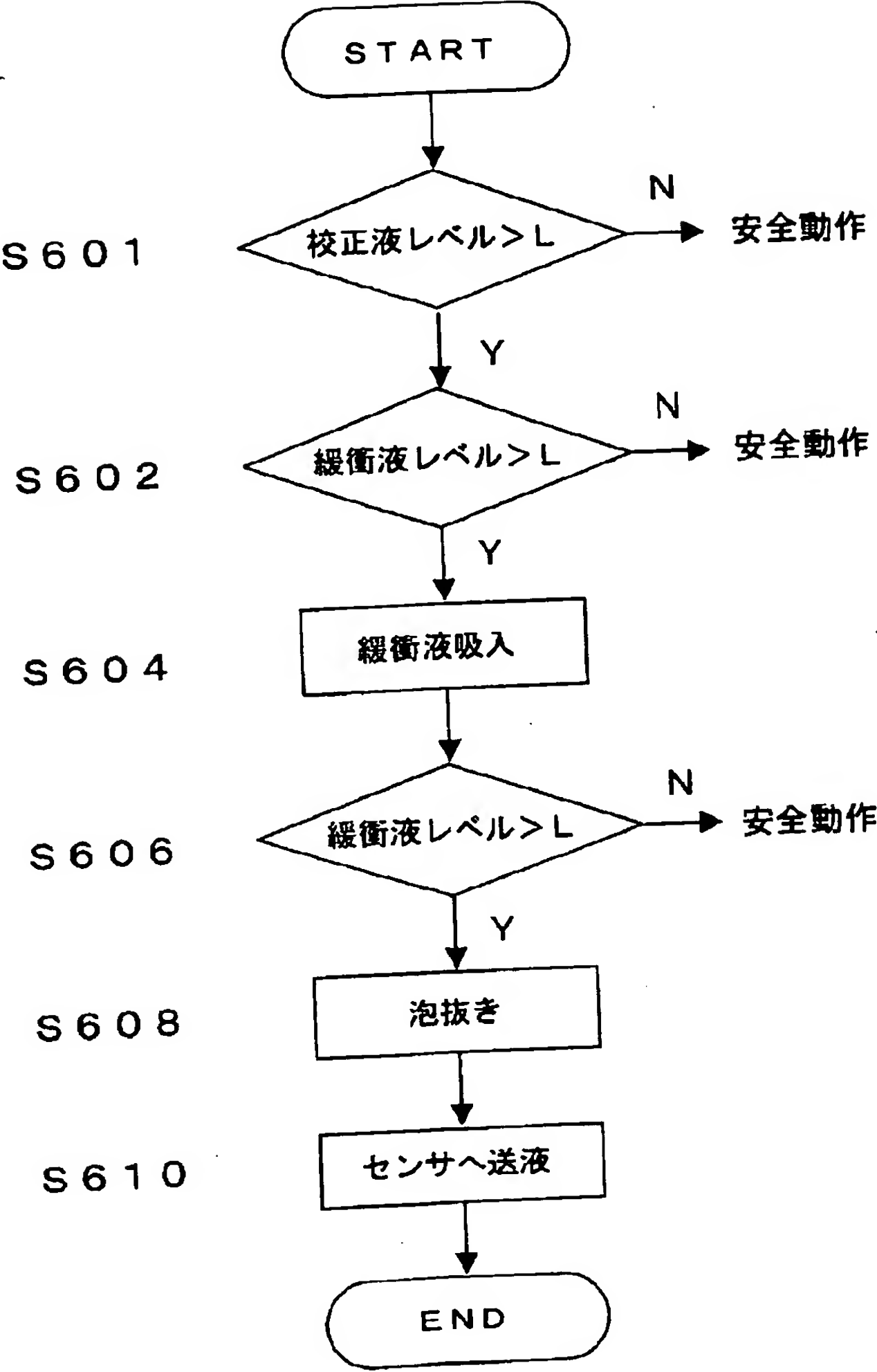
[Drawing 40]



[Drawing 31]

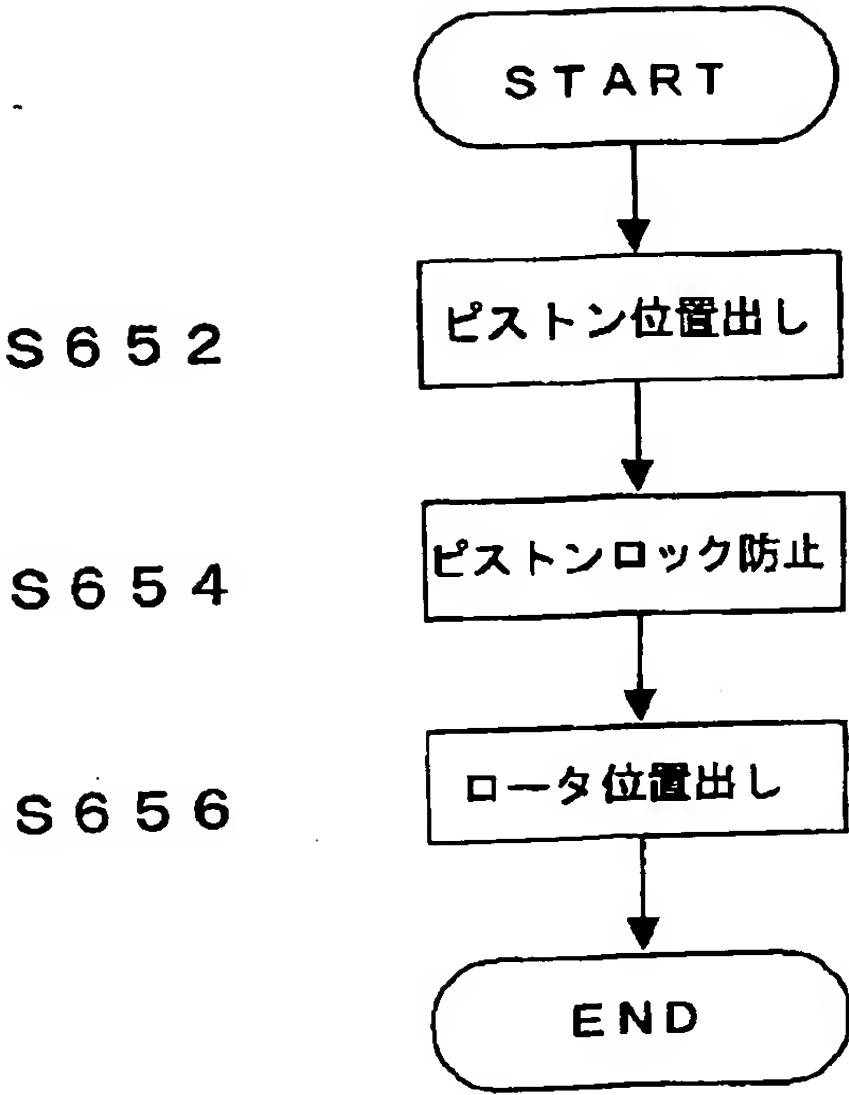


[Drawing 33]

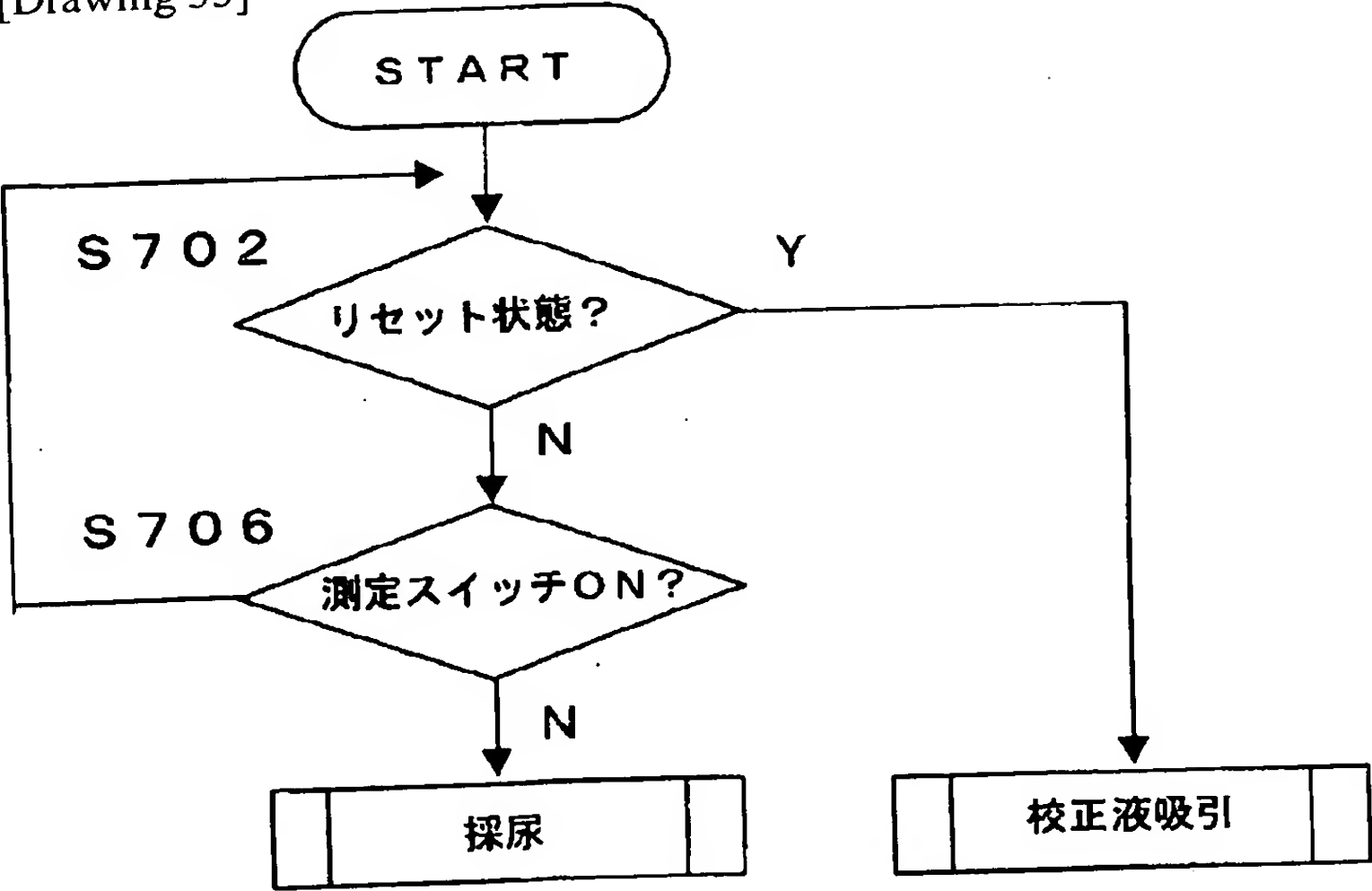


[Drawing 34]

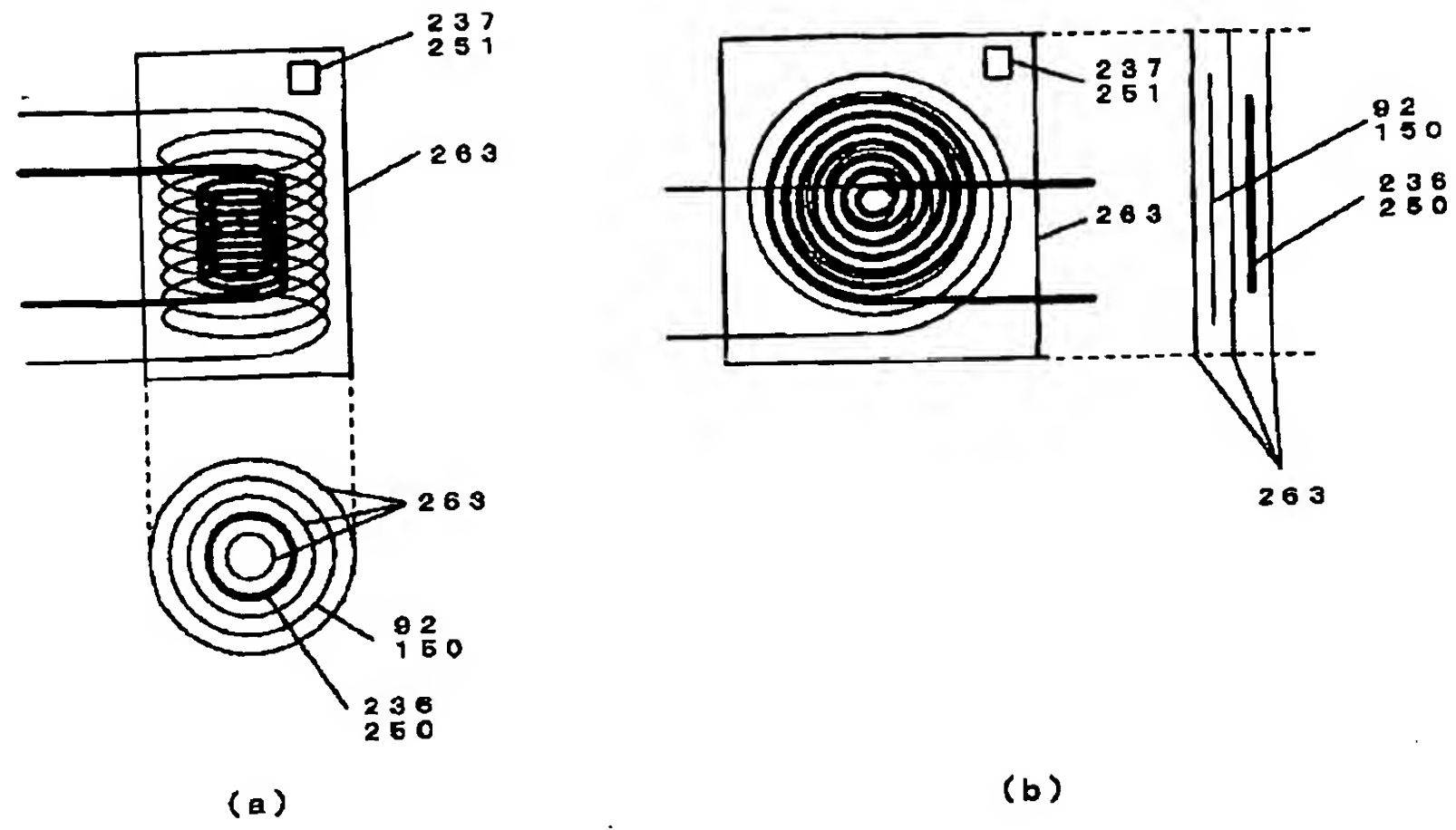




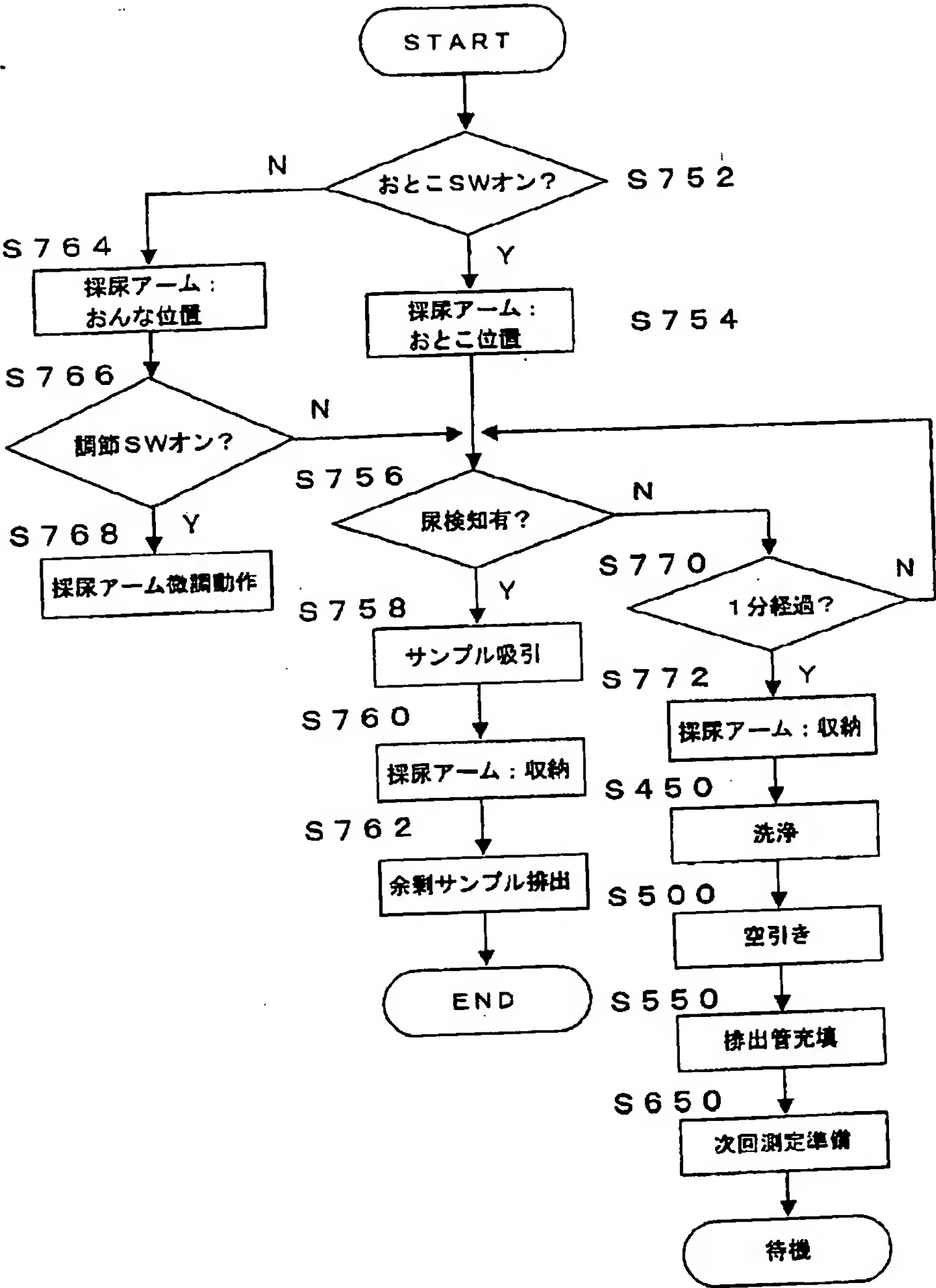
[Drawing 35]



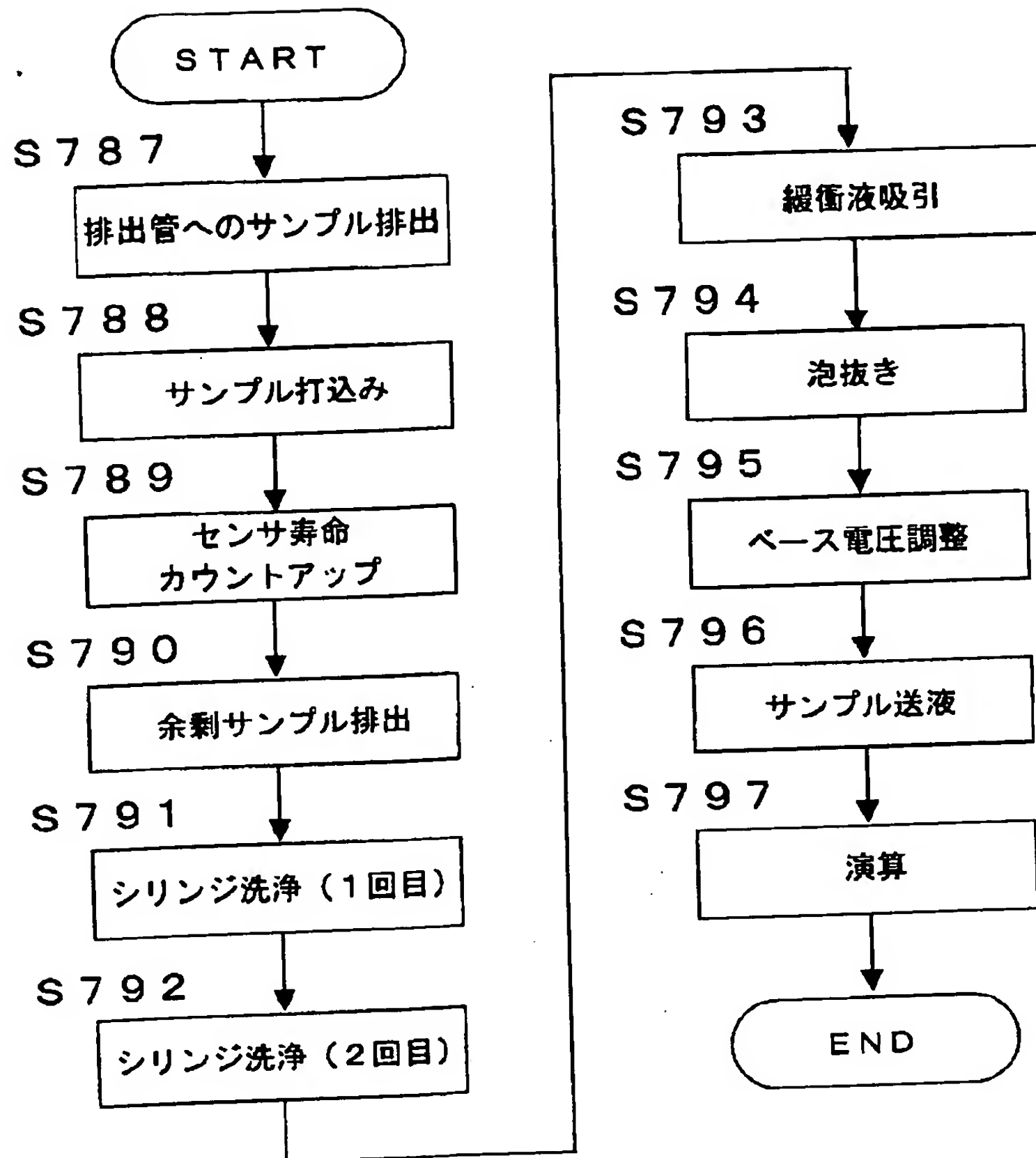
[Drawing 41]



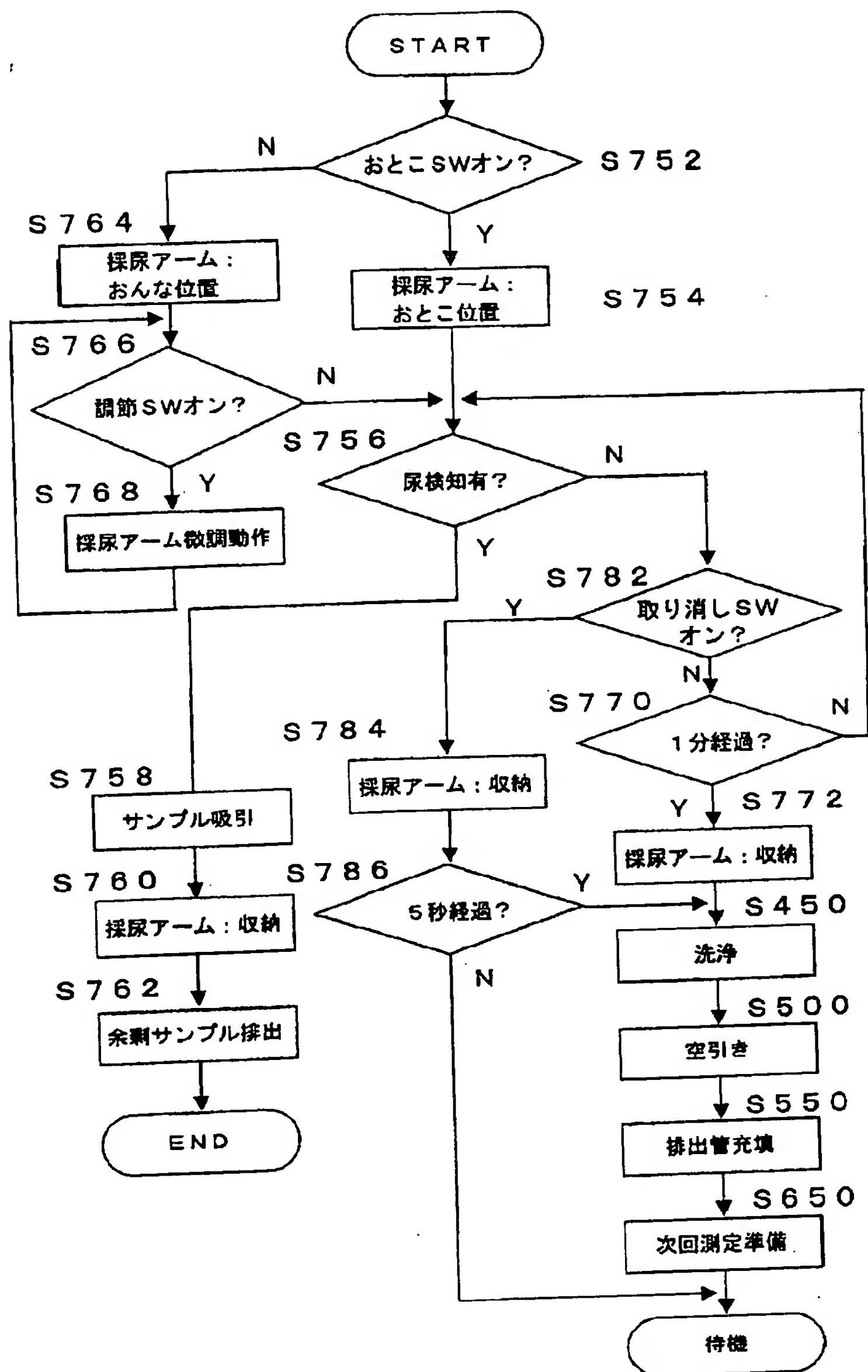
[Drawing 36]



[Drawing 37]



[Drawing 38]



[Translation done.]